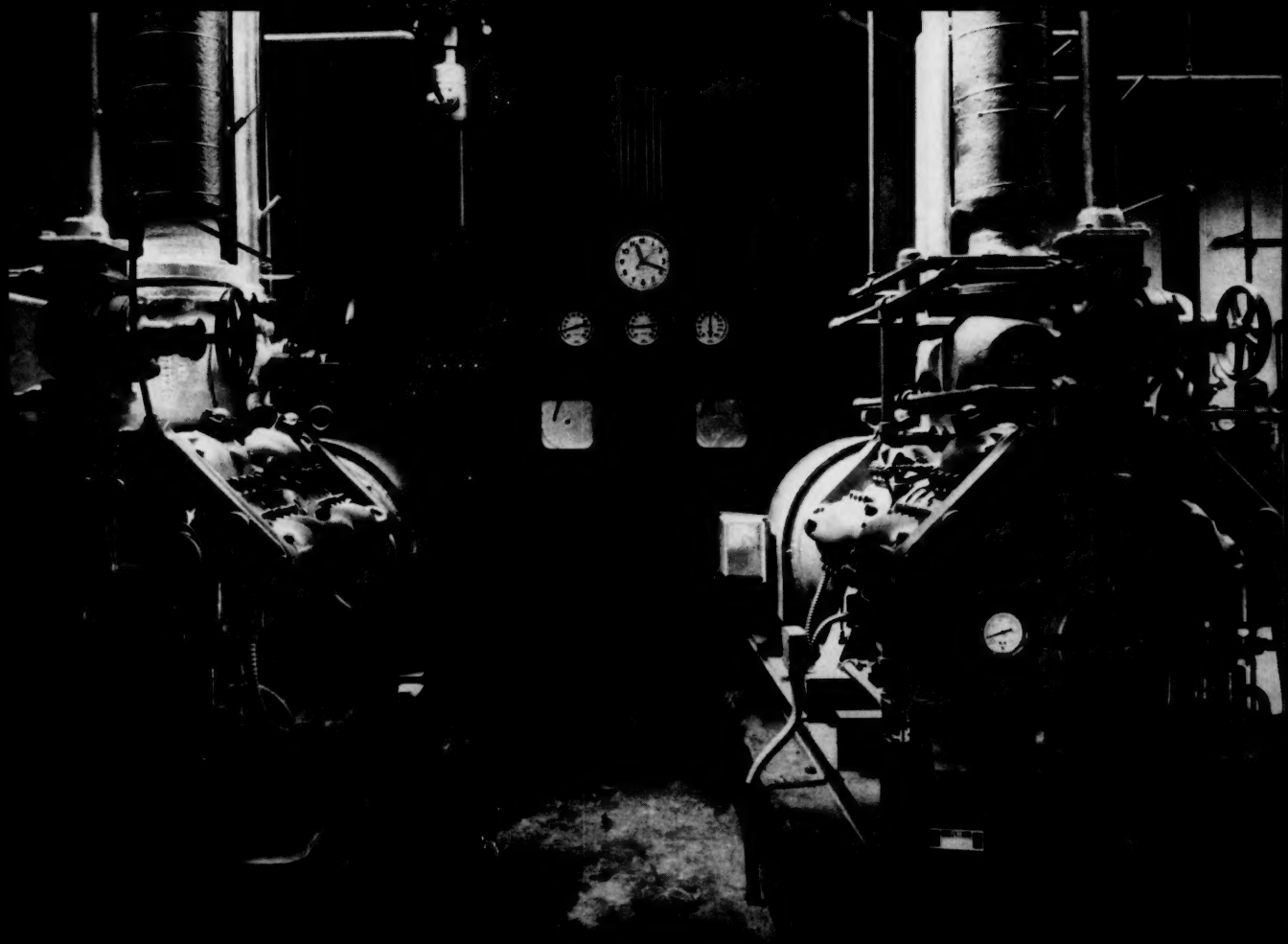
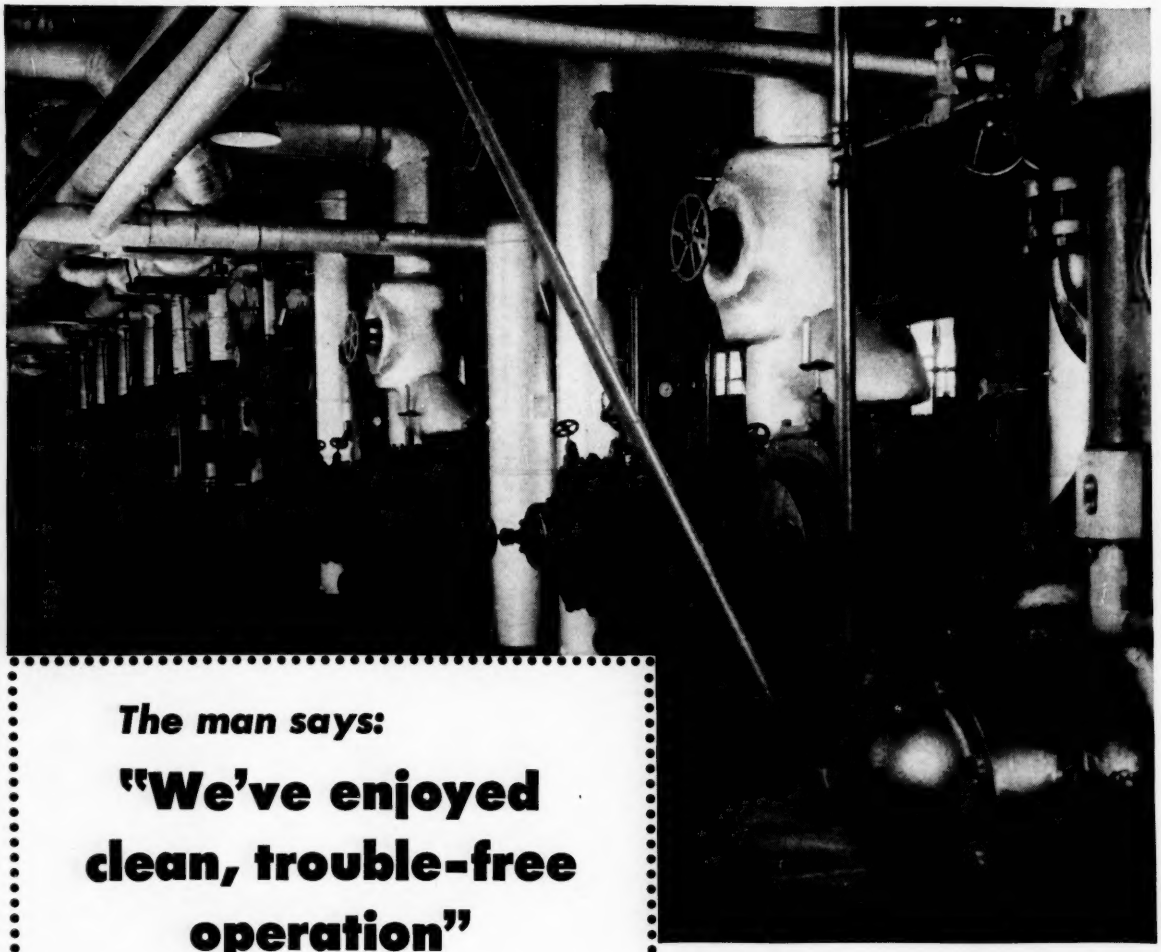
# INDUSTRIAL REFRIGERATION





***The man says:***

# "We've enjoyed clean, trouble-free operation"

***THE REFRIGERATION ENGINEER*** in this, one of the largest plants west of the Mississippi (name on request), has been lubricating his compressors with *Texaco Capella Oil (Waxfree)* for years. He says:

**"In a large plant like ours, dependable compressor performance is a must. Ever since we began using *Texaco Capella Oil (Waxfree)* we've enjoyed clean, trouble-free operation, top efficiency and low maintenance costs."**

*Texaco Capella Oil (Waxfree)* offers many advantages: (1) It won't wax out in the system—even at temperatures as low as minus 100° F.; (2) it exceeds Freon floc test requirements and the specifications of all leading refrigeration manufacturers; (3) it is stable and oxidation resistant; (4) it does not foam; and (5) is compatible with all refrigerants.

There is a complete line of *Texaco Capella Oils (Waxfree)* to meet all compressor requirements. Available in 55-gallon and 5-gallon drums, 1-gallon cans, and the more popular grades in 1-quart containers—all refinery sealed to protect purity and quality.

Talk to a Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

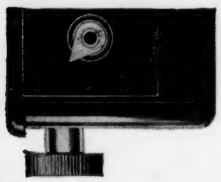
**TEXACO Capella Oils (Waxfree)**

FOR ALL REFRIGERATING AND AIR CONDITIONING COMPRESSORS

# ELECTRIC Heating Cable DEFROSTERS

## for LOW TEMPERATURE DOORS

1 • Temperature adjustment control.



2 • Adjustable thermostat for range of +85° to +245° F.

3 • Steel electrical outlet box for making connection between heating element and thermostat—inlet for power.

4 • Rabbeted channels into casing.

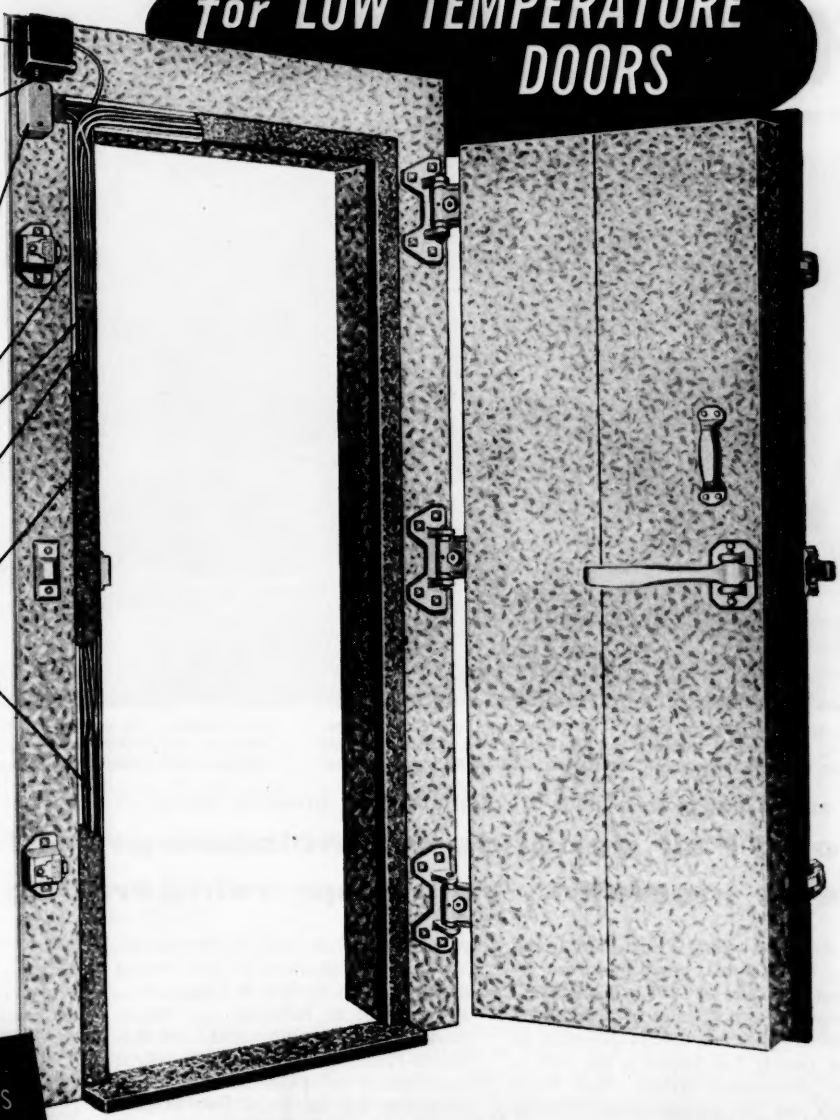
5 • Fireproof No. 26 gauge galvanized metal lined inside channel.

6 • Lead covered "heater cables" (4) held down securely by clips —approximately 20 watts to a foot. (110 volts—60 cycles).

7 • No. 10 gauge galvanized steel cover plates—removable.

8 • Capillary tube controls (on and off) thermostat.

The purpose of heating cables is to prevent icing conditions at the frame and sill areas where the door gaskets make their contact. The cables which are recessed into the frame casing are electrically heated and controlled by a "calibrated thermostat" (new improved feature by Butcher Boy), adjustable above the "dew point" of the air temperature. Since the heat expended prevents condensation it thus prevents freezing conditions.



# "Butcher Boy"

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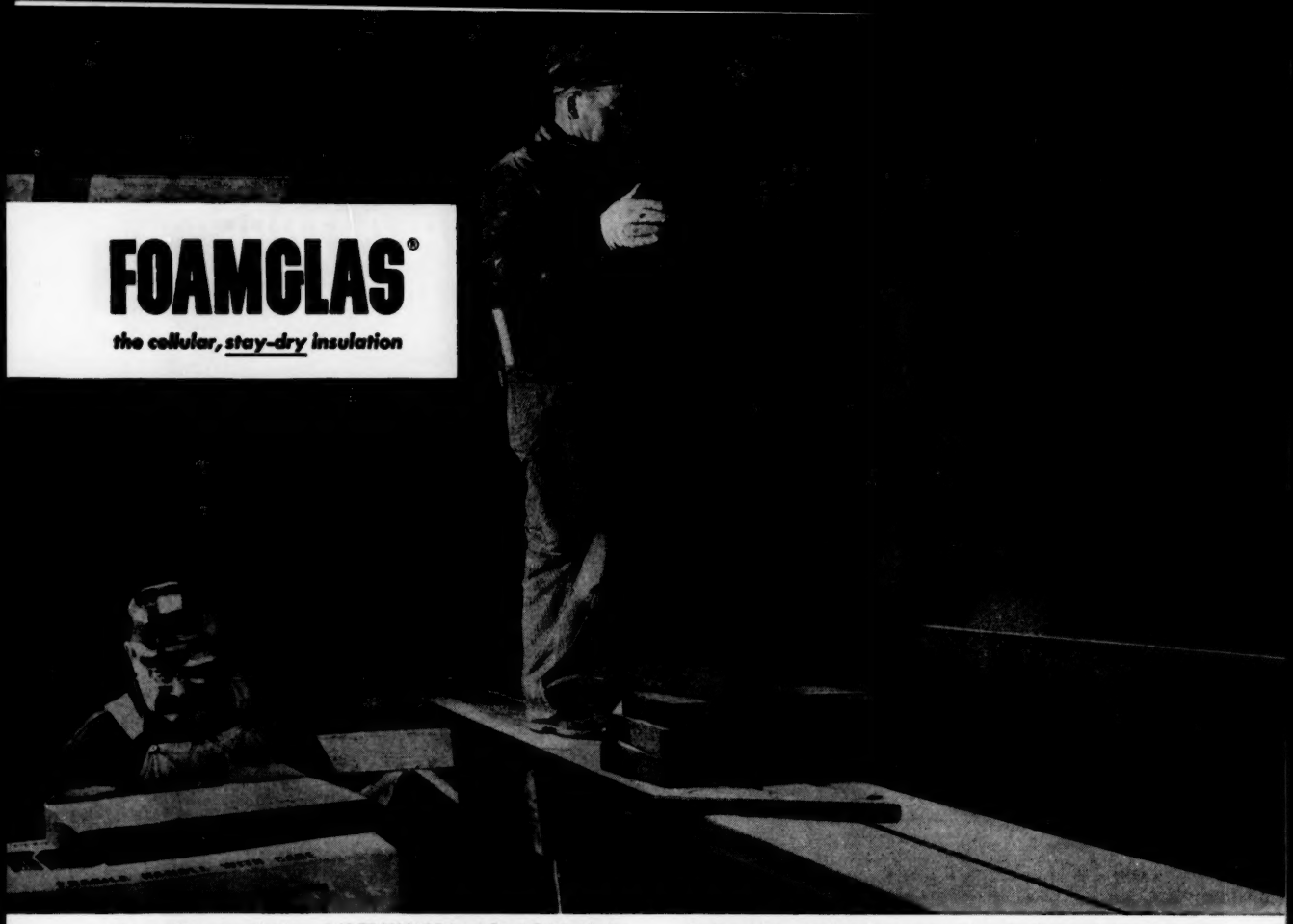


This multilayer application of 2" FOAMGLAS is at Food Fair's Linden, N. J., abattoir. In this and similar installations throughout their chain, Food Fair relies on moisture-proof FOAMGLAS to help protect food quality . . . by insuring constant, long-lasting insulating value for efficient refrigeration at low cost. Insulation Contractor: Waverly Builders, Inc., Hillside, New Jersey.

### In stores and warehouses throughout their growing chain . . .

# Food Fair depends on moisture-proof FOAMGLAS to keep insulating value up—refrigerating costs down

In ten short years, Food Fair Stores, Inc., Philadelphia, has grown from 89 stores and sales of $101 million to 237 stores and annual sales of nearly $475 million. Constant, careful attention to food quality has played a big role in that phenomenal growth. And Food Fair's use of *moisture-proof* FOAMGLAS for dependable insulation in refrigerated areas in their stores and warehouses reflects that attention to quality.

Food Fair has found that FOAMGLAS stands for constant insulating efficiency without the costly headache of insulation replacement. Its sealed cellular structure and all-glass composition make it an effective vapor barrier—sealing out the moisture that destroys efficiency of ordinary insulations. And the unique combination of FOAMGLAS strength and rigidity makes it an ideal structural material in many applications . . . even under floors where it can easily withstand loads of over seven tons per square foot.

In various applications throughout their chain, FOAMGLAS insulation for roofs, ceilings, corewalls, wall linings and floors gives Food Fair long-life insulating protection. That insures dependable, low cost refrigeration in such varied locations as an abattoir in Linden, N.J., a warehouse in Baltimore and supermarket cold rooms throughout the Baltimore-Philadelphia area. The excellent performance of FOAMGLAS in all these uses has led Food Fair to plan similar installations for their continuing expansion program.

Prove to yourself that *you*, too, can solve your insulating problems best with FOAMGLAS. Send today for a free sample and directions for six simple "desk top tests" that quickly demonstrate the valuable combination of qualities you get only with FOAMGLAS. Address . . .

## Pittsburgh Corning Corporation

Dept. T-116, One Gateway Center
Pittsburgh 22, Pennsylvania
In Canada: 57 Bloor St. W., Toronto, Ontario

PITTSBURGH PC CORNING ®
**also manufacturers of PC Glass Blocks**

With this test you can quickly prove to yourself the unique compressive strength of FOAMGLAS . . . which allowed Food Fair to use it even beneath load bearing floors. Send today for a FOAMGLAS sample and directions for six simple tests which demonstrate clearly its unique benefits.

# STAND-OUT

## Industry Turns Interested Eye on Cryogenics

ULTRACOLD liquids, a new industrial tool, are being produced in wholesale quantities at the National Bureau of Standards Cryogenic Engineering Laboratories at Boulder, Colo. These liquids are liquefied gases, principally hydrogen and nitrogen, "boiled" from a gaseous state to a liquid at temperatures colder than minus 300 F.

These scientists, operating the nation's largest hydrogen liquefier, are using these chilled liquids to create a strange world where the thermometer often approaches absolute zero—minus 460 F —where theoretically all molecular activity comes to a complete halt.

In these regions of cold, a rubber ball shatters like a Christmas tree ornament. Steel becomes immensely hard but brittle as glass. Lead rings like a bell and carries an electrical current far more easily then silver, one of the best conductors, does at room temperatures. Helium turns into two different liquids, one of which mysteriously creeps and crawls out of its container.

These strange happenings are all part of a growing new branch of science known as cryogenics, the study and use of ultracold temperatures. This aspect of physics centers on the liquefying of gases. The cold temperatures provided by the liquids go to work in a myriad of tasks ranging from fuels for guided missiles to steel manufacture to electronic computers. Much of the basic cryogenic research now taking place at the Boulder Laboratories, is being transmitted to Government, industrial and university laboratories.

The science of cryogenics is just now beginning to emerge from the tight government security wraps that have surrounded it ever since modern day guided missiles and rockets began using liquefied gases as fuel components. The security shrouds are still there, but the glimpses that the Government has permitted of late have delighted many a private research scientist.

Low temperature research is already paying off in industry. While all the "liquid cold" pouring out of the government project in Colorado goes into research activities, liquefied gases also are produced for commercial use by such firms as Linde Air Products, a division of Union Carbon

**(Continued on page 51)**


# Industrial Refrigeration

*formerly* **ICE AND REFRIGERATION**
***Now in its 65th Year of Publication***

**J. F. NICKERSON, FOUNDER**

**Vol. 131** **November, 1956** **Number 5**


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### *The Cover:*

**Two York 16-cylinder VW compressors employed on the high pressure portion of two-stage system at Safeway Stores, Los Angeles, Frozen Food Storage. Panel board instruments and indicators include audio-alarms, capacity step pilot lights, capacity control switches, recording temperature controllers and the usual suction, intermediate and discharge pressure gauges. Plant is automatic, except for compressor selection and defrosting. See story, page 13.**


Published Monthly by NICKERSON & COLLINS CO.

General Offices: 433 N. Waller Ave., Chicago 44, Ill. Telephones: AUstin 7-1303-04-05

H. T. McDERMOTT, EDITOR AND PUBLISHER — E. R. CURRY, MANAGING EDITOR — J. R. KELAHAN, TECHNICAL EDITOR — H. D. BUSBY, ASSOCIATE EDITOR

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INDUSTRIAL REFRIGERATION, Vol. 131, No. 5 Published monthly at 433 N. Waller Ave., Chicago, Ill., U.S.A., by Nickerson & Collins Co. Yearly subscription in the U. S., $2.00 per year; other countries, $3.00. Single copies, 25 cents.


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*Industrial Refrigeration is indexed regularly by Engineering Index, Inc., and is microfilmed for library use by University Microfilms.*

# What's New

MACHINERY
APPLIANCES • PROCESSES

## "Roll-Out" Railway Air Conditioning Unit

A NEW diesel engine-compressor "roll-out" railway air conditioning unit is announced by The Trane Company, La-Crosse, Wis. The unit was introduced, recently, during the Railway Electric Supply Manufacturers' Association Exposition in Chicago, for the electrical and mechanical divisions of the Association of American Railroads.

*Trane Diesel engine-compressor railroad air conditioning unit as it appears in normal under-car operating position. Below, the unit as it appears in rolled-out position for servicing.*

One of the principle features of the Trane package is that it utilizes a diesel engine as its power source, and is direct-connected to the air conditioning compressor. The use of the diesel engine eliminates about 50 per cent of the electrical load required for the operation of conventional cooling equipment.

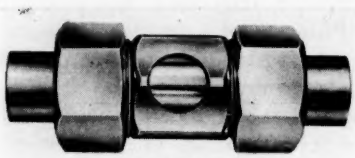
Designed for installation under cars, the compact unit, measuring only 55-½ x 33-½ x 25-⅞ inches, includes integral extension tracks to allow it to be rolled out from beneath the car for quick inspection and time-saving maintenance. According to the manufacture, the unit provides the necessary flexibility for applications on conventional cars, suburban or gallery cars, and partial or full-dome cars. Capacity ranges up to 15 tons of refrigeration.

Included in the engine-compressor package is an engine cooling system, fuel and lubricating oil filters, compressor controls, flexible refrigerant and fuel lines, and electrical cables. The package is also provided with complete internal wiring and piping. Self-sealing couplings are standard on refrigeration hoses, as are disconnect plugs and receptacles with electrical cables.

Controls include a refrigeration dual pressure safety switch, a diesel engine low oil pressure and high water temperature safety switch, compressor test switch, and engine starting equipment. The controls are all mounted on a control panel which also has compressor oil pressure, suction pressure and discharge pressure gauges with shut-off valves.

## New Liquid Eye Cuts Costs

A NEW, more simplified time saving unit — the "250" Series Liquid Eye — especially engineered to cut manufacturers' production line costs, has been designed by Allin Manufacturing Co., Chicago. Besides having all the Liquid Eye advantages, the "250" Series additionally features a newly designed one-piece extension-gasket, forming a positive seal that

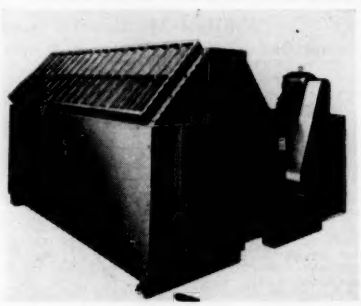


*New Liquid Eye Positive Sealing Indicator*

is always in place. Ready for immediate installation, the "250" fits perfectly into the pre-assembly and final assembly operations, keeping pace with the fastest production schedules. The unit is fool-proof, practically doing away with rejects due to cocked gaskets, improper sealing and other assembly line errors. It's smaller, more compact, eliminates the need for separate gaskets. Available in six sizes: ⅜, ½, ⅝, ⅞, 1-⅛ and 1-⅜ inches O.D.S. — with special sizes available to exact specifications.

## New Multi-Zone Climate Changer

AN AIR conditioning unit for buildings where one or more zones call for maximum cooling while other zones require lesser degrees of cooling, and still others, heating; has been announced by The Trane Company, La Crosse, Wisconsin. This completely redesigned unit, which Trane calls "Multi-Zone Climate Changer," was created to supply any combination desired; complete air conditioning, cooling only, heating only, cooling and ventilating, heating and ventilating, heating and humidification, or ventilating only; furnish conditioned air for up to as many as 25 zones, at temperatures which can be varied to the requirement of each zone; eliminate the need for reheat coils and their separate controls in ducts leading to individual zones; allow for job-site zoning flexibility through an improved discharge damper section design, permitting simplified damper grouping and duct installation; provide the advantage of using just one source of either chilled water or refrigerant.



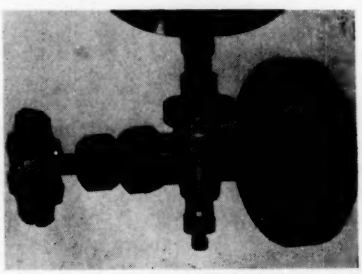
*New Multi-Zone Climate Changer*

The Multi-Zone Climate Changer line, available in nine sizes with capacities ranging from 1700 to 2900 cfm of air, will supply complete year around air conditioning for an entire medium size building, the makers say. The unit can use any type of cooling and heating coil including chilled water, direct expansion refrigerant, steam or hot water; thereby making it possible to use it under widely varied conditions.

In addition to Trane coils, other matched components include the new damper section arrangement, redesigned double-width, low velocity unit fans, humidifier (three types available), high or low velocity filters and mixing box as specified.

## New Offset Valve

A NEW Valve for instrument piping and general use which acts as a block valve, as well as greatly reducing the number of threaded connections required, is being introduced by Jerguson Gage & Valve Company, 80 Fellsway, Somerville 45, Mass.



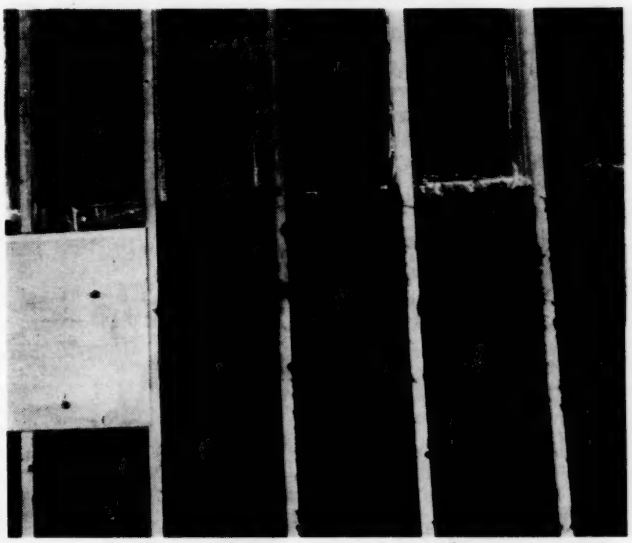
*New Jerguson 66U-VG valve for instrument piping*

This new valve, the Jerguson 66U-VG, is an offset valve with a vertical rising ball check on the downstream side of the seat and with a solid shank connection to the vessel which makes it acceptable as a block or root valve, and makes it possible to eliminate the usual block valve.

These valves combine unions, nipples, reducers, elbows, tees, valve and drain valve into one space saving unit, thus greatly reducing the number of threaded connections. They have a double seating stem for repacking under pressure and a pressure bleeder valve and test gage connection. Seats are regrindable and renewable; and the valves have union connection to the gage. Many optional features and other connections are available.

# Stop vapor and heat leaks with VOID-FREE PALCO WOOL® Insulation and complete open wall inspection

**1** **Vapor barrier is completed *before* application of insulation, allowing full inspection to eliminate all possibilities of breaks or unsealed penetrations of the vapor barrier.**



**2** **Void-free method of placing *Palco Wool* in the entire wall *before* interior finish is applied allows complete inspection of insulation to eliminate any possibility of voids or pockets.**

At recommended density of 4.5 lbs./cu. ft., *Palco Wool* has the inherent resilience to stay in place without support of interior finish construction. It displaces so much air that convection currents are virtually eliminated. Impervious to moisture effects and deterioration, it has no intermediate vapor dams to trap moisture and lower efficiency. There are no joints or edge leaks. Complete inspection eliminates possibility of pockets or voids. Application of interior finish is completely independent of insulation placement.

**FULL INSPECTION ELIMINATES HUMAN ERRORS IN APPLICATION OF VAPOR SEAL AND INSULATION**

**1.** Vapor barrier and support members for finish wall are completed before insulation is applied, allowing full inspection to eliminate vapor leaks.

**2.** *Palco Wool* is packed behind temporary retainer sheet.

**3.** *Palco Wool* is packed behind second temporary sheet.

**4.** Lower temporary sheet is removed, placed above second sheet, and packing process is continued. Process is repeated until entire wall is packed.

**5.** Temporary sheets are removed, and entire wall is inspected to determine that there are no pockets, voids, settlement. Interior finish is then applied.

see our catalog in SWEET'S INDUSTRIAL CONSTRUCTION FILE or write for copy

**SEE THE NEW REFRIGERATION INSULATION MANUAL IN SWEET'S INDUSTRIAL CONSTRUCTION FILE OR SEND COUPON AT RIGHT FOR YOUR FREE COPY**

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# PHILLIPS
# Float Controls

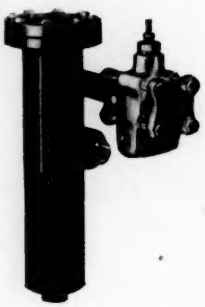
**Modulating Valve Action Gives Smoother, More Efficient Operation**

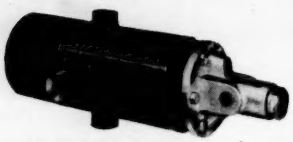
Phillips Controls continuously adjust refrigerant flow to the refrigeration load. *All* the evaporator tubes are kept wetted *constantly* to produce the best heat transfer rate of which your equipment is capable. "Hunting" in system is eliminated, thus compressor loads are even and maintenance is kept low. Check the following against your own requirements.

## REMOTE FEED VALVES

**No. 101 Remote Feed Valve with Float Chamber for Ammonia or Freon.**

For shell and tube type coolers, large room coils and various types of tank coils. Float with adjustable level located in chamber outside the evaporator; "Level-Eye" with Frost Shield on chamber shows normal liquid level. Capacities to 50 tons for ammonia, 12 tons for Freon.





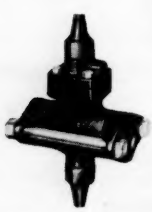
**No. 301 Remote Feed Valve for Ammonia or Freon.**

Cartridge-type unit for easy replacement of needle and seat. Float chamber (equipped with "Level-Eye" with Frost Shield) connects to evaporator with balance or equalizing lines. Capacity to 50 tons ammonia and 10 tons Freon.

## PILOT OPERATED FEED VALVES

**Phillips Pilot Float Valve with level adjustment and "Level-Eye".**

Pilot operation of valve permits higher capacities to be handled with modulating-type control. Can be operated by Phillips Pilot Valves, thermal expansion or solenoid control. Models for both high and low side installation. Capacities from 1 to 1000 tons for Freon, 1 to 2000 tons ammonia.



**Phillips Pilot Operated Feed Valve**

**Write for full details and typical hook-up drawings.**

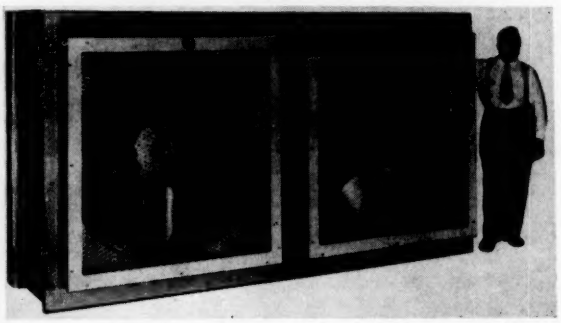
**PHILLIPS** **H. A. PHILLIPS & CO.**
DESIGNERS AND ENGINEERS
REFRIGERATION CONTROL SYSTEMS

**3255 W. Carroll Ave. • Chicago 24, Illinois**


## Single Unit Air Cooled Condenser

A LARGE single unit air cooled condenser has been announced by Refrigeration Appliances, Inc., Chicago, Ill. The remote-type Freon condenser is the latest addition to the long line of Krack industrial air conditioning and refrigeration units, designed and built by the Chicago manufacturer.

The new, quiet operating belt-drive condenser is claimed to eliminate all water problems. "Air is drawn through the coil on the counter-flow principle, providing a more even distribution of air and making for more efficient use of the condenser coil surface," the manufacturer pointed out.



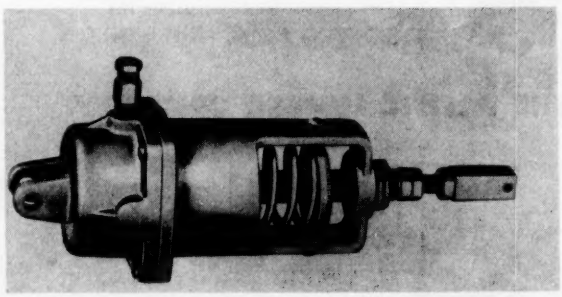
*Front or fan view of new air cooled condenser introduced by Refrigeration Appliances Inc., Chicago, Ill.*

Available in units from 1 to 30 tons, the condenser operates on nominal ratings based on 110 F condensing temperature. This factor is said to eliminate the necessity of oversizing condensers relative to machine horsepower under normal conditions. The coil element is constructed of copper tubing and bonded aluminum fins. The tubing is electro-tin-plated to resist corrosion. All steel coils, hot-dipped galvanized after fabrication, can be furnished for special applications. Enclosed, ball bearing motors and rust resistant fan blades are located inside a galvanized sheet steel housing. The motors are mounted on a specially designed platform, so belt adjustment can be semi-automatically performed without the necessity of entering the unit. External alemite fittings make the greasing of fan and motor bearings a simple operation. The condenser is available in a variety of models including vibration-proof shelf mountings and floor and ceiling hung units. Metal screens can be furnished to protect fans and motors.

## Diaphragm Motor Provides Gradual Action

AIR, water, or oil pressure can be used to power three gradual-acting Powerstroke diaphragm motors announced by the Powers Regulator Company, Skokie, Ill., manufacturers of automatic controls. The motors are intended for gradual push-pull control of levers or rods on industrial equipment, as well as for heating, ventilating, and air conditioning control, the company said.

Unlike conventional two-position air motors, the Powerstroke models permit an infinite number of shaft positions through the stroke range. Three-inch, 4-inch, and 6-inch sizes are available, with respective thrusts of 80, 235, and 500 pounds, and maximum strokes of $2\frac{1}{8}$, 3, and $4\frac{1}{8}$ inches.



*New Powers Gradual Action Diaphragm Motor.*

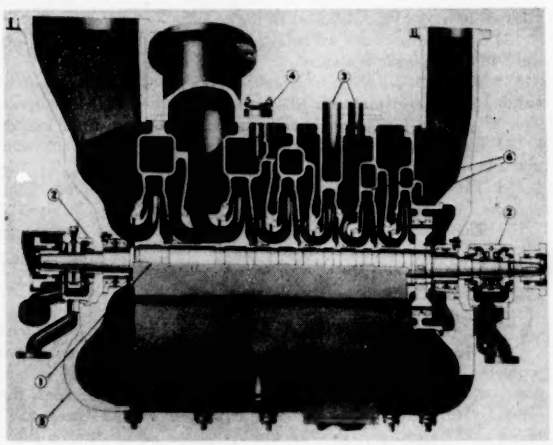
In operation, air or hydraulic pressure on the molded neoprene diaphragm advances the spring-loaded piston. When pressure is relieved, the spring returns the piston to its starting position. Length of the piston's forward and return strokes, as well as the pressure required to start the motor, are easily adjustable over a broad range on all three motor sizes.

On the 3-inch Powerstroke, the stroke is adjustable to 2⅛ inches. Five and 10-pound springs are available, each adjustable from 2 to 7 pounds starting pressure. Supply pressures up to 22 psi can be used. The stroke on the 4-inch motor is adjustable to 3 inches, with starting pressures adjustable from 1 to 5 psi on the 10-pound spring furnished. The diaphragm will take supply pressures up to 25 psi.

A stroke range up to 4⅛ inches is provided on the 6-inch motor. Either a 10 or 15-pound spring is supplied, with starting pressures adjustable from 3 to 5 psi. Supply pressures up to 30 psi can be used. A hesitation spring feature on all three motor sizes permits their use where a mid-stroke pause is desired. Housings are cast aluminum. All parts including the shaft are noncorrosive. The motors can be frame mounted or extended-shaft-mounted, with mounting kits available.

## New Compressors For Air Conditioning

THE KATHABAR Division of Surface Combustion Corporation is producing a line of centrifugal compressors. The units, ranging from 200 to 2000 tons, are used in comfort and industrial process air conditioning. They are of the overhung type with two stages, balanced back-to-back impellers and diffusers.



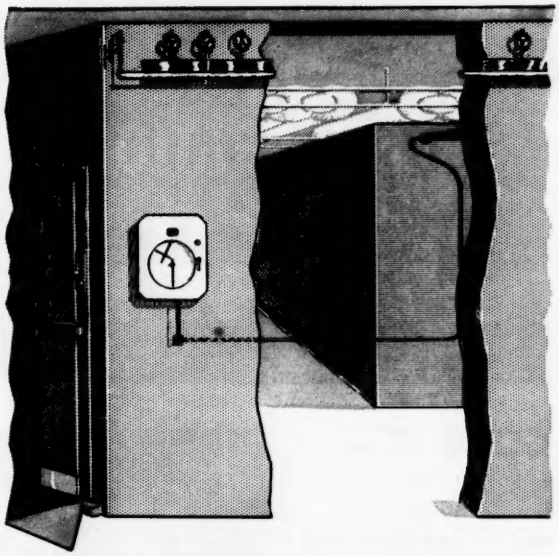
*New compressor unit introduced by Kathabar Division Surface Combustion Corp.*

Automatically controlled adjustable inlet guide vanes provide optimum stability and efficiency at all loads, 20 to 100 percent. The use of the guide vanes, a notable first in the large centrifugal air conditioning field, permits constant speed operation with a squirrel-cage induction or synchronous motor with lower power input through the control.

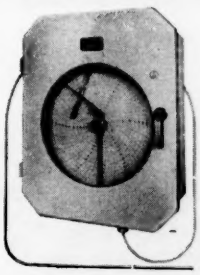
## Little Announces Improved Gas Liquefier

LOW temperature testing laboratories and manufacturers utilizing such equipment will be interested in the announcement by Arthur D. Little, Inc., of a new 40-liter/hour hydrogen liquefier. This new product features a safe low-pressure helium-refrigerated cycle operating without liquid nitrogen. According to the Little firm it does not need an auxiliary purification trap, using instead a duplex freeze-out exchanger.

This liquefier has a built-in storage receiver and is designed to permit indefinite internal storage without evaporation loss. The device can be adapted to other liquefied gases such as neon, methane, argon, fluorine, etc. Information may be obtainable from Arthur D. Little, Inc., Cambridge 42, Mass.

# Witness for the PROTECTION . . .



FOR your protection . . . and the protection of your customers' food. The Taylor Locker Room Thermometer gives you an accurate, continuous permanent record of the temperature inside your locker room—from a convenient point outside the room.

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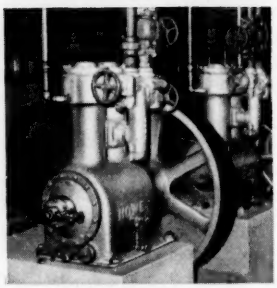
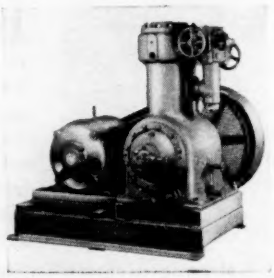
## COOL IT —

with one or more of Howe's complete line of modern space-saving automatic ammonia compressors. Sizes — 2 to 150-ton capacity. Built for maximum service with minimum cost.



## FREEZE IT —

with Howe Booster Compressors. Food freezing techniques to meet today's rigid requirements. Can be engineered and built to your local plant conditions with equipment manufactured by Howe.



## HOLD IT —

A complete line of high efficiency unit coolers, polar circle coils, fin type coils — designed to handle any size of storage cooler or storage freezer. For preserving fresh and frozen foods.

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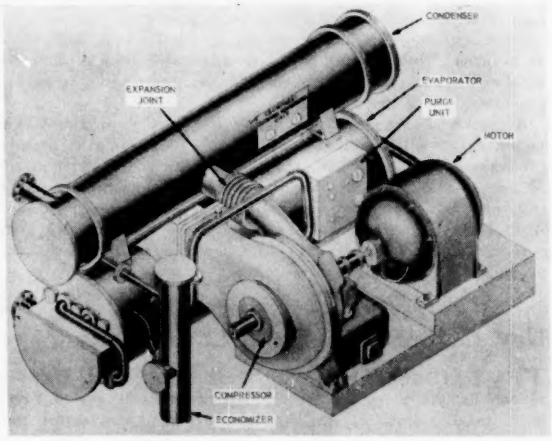
## Multi-Stage Compressor

THIS new Worthington multi-stage compressor is designed for use with air, ammonia, and most hydro-carbon gases. The five casing sizes give a capacity range from 570 to 82,000 C.F.M. per casing with discharge pressure to 950 psig. Six outstanding features of the new compressor are:




*The new Worthington multi-stage compressor*

(1) Casings and diffusers are horizontally split at the centerline with no bolting of the diffusers to the casing.

(2) The bearings are externally mounted to the casing and are open to atmospheric pressure.

(3) Accommodations for large bleed-in-bleed-out flows permit handling of different levels of refrigeration or stepwise compression of process loads and knockouts with one compressor casing.

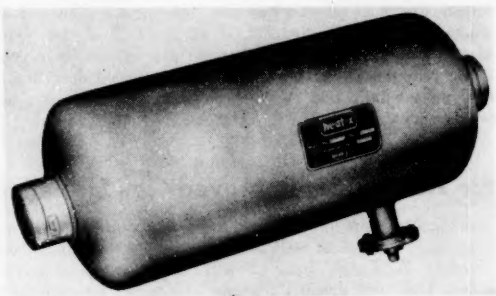
(4) Liquid interstage injection cooling reduces heat of compression.

(5) The castweld fabricated design insures known sound components from basic materials to finished product.

(6) The horizontally split enclosed diffusers allow continuous gas guidance through compression range.

## New Separator-Muffler

A LINE of 'OSM' Oil Separator-Mufflers has been introduced by Heat-X, Brewster, N. Y. which solve, in one unit, two problems common to refrigeration systems: silencing of system noises and separation of all oil entrained with hot gas from the compressor. 'OSM' units are also equipped with a mechanism which automatically returns to the crankcase all oil that is separated. The manufacturer points out that ratings of the units are based on tonnage rather than horsepower, thereby permitting close matching of unit to requirements. This method of rating also elminates the need to buy more capacity than is required.



*The New 'OSM' Oil Separator-Muffler introduced by Heat-X*

The new units have no floats which can hang open or stick closed. A positive action Velocity Pressure Mechanism, exclusive with Heat-X, opens only when compressor is running and closes of its own weight when compressor stops. Units are available from 1 to 75 Tons F-12 and 1 to 100 Tons F-22.

# PRESS BRIEFS

## 1956 Pack of Frozen Green Peas Sets All-Time Record

THE 1956 pack of frozen green peas skyrocketed to an unprecedented 352,215,604 pounds, according to a preliminary survey by the National Association of Frozen Food Packers. This represents a 52 percent increase over the 231 million pound record of 1955.

The spectacular increase in Western production 79 percent greater than last year, is largely responsible. The pack in that region alone, principally in California, Oregon, and Washington, was greater this year than any previously recorded United States total pack. A 19 percent increase was reported in the East and South, while poor growing conditions earlier in the season were reflected in a 23 percent decrease in the Midwest, as compared with 1955 production.

Container size usage generally followed the traditional pattern, but with certain significant modifications. The 10 ounce package remains the vastly dominant retail size. However, the sharply increased use of the 12 ounce package in 1956 marks abrupt reversal of the trend away from this size in recent years. The 2½ pound size continues to dominate the small institutional pack. The 3 pound size shows some increase in popularity, but no use of 4 and 5 pound containers was reported this season. The bulk pack in large sizes, 50 to 60 pounds cases for the most part, accounted for about one-third of the total 1956 production.

## Radiation and Public Health

THE PUBLIC is learning just what is involved and how much (or rather how little) is known about the effects of radiation on health and particularly on genetics as a result of two studies — one in Great Britain and one in the U. S. The following sentence raises an important question: "The inevitable adverse influence of increased radiation on health and on the genetic endowment of man must be balanced against the needs for defense and for additional sources of power." (It's a summarizing statement from the report of the US Nat'l Academy of Sciences).

It seems likely that democratic opinion will build up heavily against sacrific of health for additional power sources, and even against atomic warfare. The time has come for comprehensive research on this question and a decrease in the rush toward applications of atomic energy until health research catches up. This illustrates the fact that science and research — the most potent of all the forces in the world of men — are capable of leading us in unwholesome, as well as favorable, directions, if we are not alert and careful.—TRRF Bulletin.

## Swift Opens New Storage

A NEW cold storage plant has been opened by Swift & Company at Monroe, Wis. The refrigeration unit consists of two Worthington 20-ton compressors, two 10-ton Marlo brine spray units, blower units, and a 7-ton air handling unit in the Cheese cutting rooms. This is said to be the most modern and efficient cold storage plant in that section of the country. Green County is acknowledged to be the cheese capital of the middle west. The installation was made by the Richardson Electric Co., Monroe, Wis.

## New System Eliminates Handling Packaged Meat

ARRIVAL in Chicago of four portable dry-ice chests on a Milwaukee road flatcar completed a test of a new system of shipping meats. Participating in the test were the George A. Hormel Co., meat packer, the North American Car Co. and the Clark Equipment Co. Hormel furnished the meats, and the two other companies the specially designed "Mobile Reefers."

Main features of the new delivery system is the ability to prepack meat at the plant for a specific delivery route. It can be held at a steady low temperature in the original container until it is unloaded at the retail store. H. H. Corey, Hormel chairman, said the traditional method of shipping meats required multiple handling and that this is eliminated by the new system.

The chests are served by dry ice and the chilling temperature is maintained throughout them by electric fans driven off the wheel of the car and the battery of the fork lift truck. Each chest carried five tons of meat products.

## St. Louis Warehouses Protest Tax on Stored Goods

WHO should pay taxes on all the frozen turkeys, butter, eggs and other food products held in St. Louis cold storage warehouses? The question was argued before the State Tax Commission, which is hearing assessment appeals filed by 17 cold storage firms. When the companies declined to tell the city who owned the stored wares, St. Louis Tax Assessor John Poelker retaliated by treating the goods in storage as part of inventory, estimated the taxable value at $2,295,000 and billed the warehouses.

Out-of-town firms own a large part of the perishables stored here, but Poelker says the merchandise nevertheless is subject to the St. Louis personal property tax. In a move to tighten city tax collection, he wrote the cold storage companies last December requesting that they list owners of goods held here.

The companies refused, contending that a confidential business relationship is involved.

These appellants were Federal Cold Storage Co., assessed for $200,000 worth of merchandise, and Mound City Ice & Cold Storage Co., assessed for $175,000.

## Commodity Buying Stepped Up

THE COMMODITY Stabilization Service has stepped up its price support operations and is buying frozen hamburger, shell eggs and frozen turkeys to help keep prices of these commodities up. Plans are to move these commondities directly into the school lunch program and to avoid storage, if possible. However, it is reported that some storage may result if these products do not move through the school lunch program as quickly as anticipated. As of September 28, CSS had purchased 19,650 cases of shell eggs and 3,228,000 pounds of frozen hamburger.—NARW Quick Sheet.

## General Foods Closes Plant

GENERAL Foods Corporation planned to close its Birdseye frozen food plant at Rockland, Maine at the end of the current packing season about November 1. The plant processes and freezes ocean perch. A. M. Shultz, manager, said the plant has been operating at a loss for several years. About 250 workers had been employed, of which approximately 200 were seasonal. The annual payroll amounted to about $1 million. The company will try to find a buyer for the plant and its fleet of nine trawlers.

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3628 E. Olympic Boulevard, Los Angeles, Calif.
Gaspro Products, Inc., P. O. Box 2454, Honolulu 4, Hawaii
Los Angeles Chemical Company, 1960 S. Santa Fe Street, Los Angeles, Calif.
Mefford Chemical Company, 1026 S. Santa Fe Street, Los Angeles, Calif.
Phillips Refrigeration Products, Inc., 444 Potrero Ave., San Francisco, Calif.
Western Chemical Company, 625 S. 5th Street, Phoenix, Arizona
Western Chemical & Mfg. Company, 3270 E. Washington Blvd., Los Angeles, Calif
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# In the Spotlight

**ULTRACOLD** Liquids, a new industrial tool, are now being produced in large quantities at the Cryogenic Engineering Laboratories of the National Bureau of Standards at Boulder, Colo. The results of this research is already paying off in industry, in steel and plastic processing and other processes. For details, see article on page 3.

**PRIVATE** warehousing of frozen foods was undertaken recently at Los Angeles by Safeway Stores. Although only a 32,000 cu. ft. storage is in operation, the plant is designed for doubling this capacity—a plan which appears certain to be followed shortly. The plant is the unattended variety, employing a service and maintenance contract with the vendor-contractor which includes weekly defrosting and equipment changeover. Vestibule arrangements prevent frost and ice accumulations of any great magnitude. See page 13.

**RADIATION** Preservation of Foods was the subject of a panel discussion recently by representatives of the U. S. Army, leading experts from the office of the Quartermaster General, the Department of the Army and the Surgeon General's Office. Pertinent information was presented on the nature of the radiation process, current state of its development, its effect on the wholesomeness of foods, and future potentialities of the process. Pertinent parts of the discussion are covered in the article starting on page 15.

**A CARVED ICE** display was an attracive feature of the opening of new plant of the Northwest Packing Company in Portland, Ore. For description and picture of the display see story on page 50.

**SALT WATER** ice for icing of fresh fish was investigated by the Technological Laboratory of the Ministry of Fisheries, Copenhagen, Denmark, and reported at an international meeting of fish processing technologists at Rotterdam. Among the results, it was found that the fish gained more from the delay in spoiling than it lost through partial freezing and salt uptake. Report of the investigation is made in article on page 20.

**A BEEF HOUSE** in Cincinnati has lived through refrigeration supplied by natural ice and the various stages in between to the present modernization development of push button operation. A new addition has been completed recently which provides an easy flow of goods through the plant and operation with only ordinary maintenance inspection. For details of the modernization program, see article starting on page 21.

**THE ANNUAL** Ice Convention will be held at Atlanta, Ga., November 13-16. Headline speakers have been selected and a strictly practical program is being planned for the business sessions. Entertainment for the ladies and for members of the convention has been planned. For other details see story on page 23.

**TO PROTECT CORK** insulation in refrigerated rooms from damage by fork trucks and for protecting cork pipe covering on insulated pipe lines outside the building special methods were used, including a concrete bumper, a two-by-four stud wall, pipe line covered with aluminum sheeting and heavy vapor-seal paper. The essential details are told in article on page 25.

**NAPRE** continues its operational series on the "Prevention of Refrigerating Plant Failures" with an article on rotary boosters page 27. Fifth of the set, this article not only describes service, operation and maintenance, but also emphasizes the importance of design to effective and efficient inspection and overhaul. As a design consideration, the author points out some six factors in piping and heat exchange vessel layout which materially affect life and performance of any type booster machines.

**MAINTENANCE** was the predominant topic of the 47th Annual Convention of the National Association Practical Refrigerating Engineers held October 29 through November 2 at Detroit. Five topics were devoted to this subject and additional presentations were on servicing. A preliminary report of the convention proceedings is given in the article starting on page 36.

**A CANADIAN** brewery established in 1790 has completed a three-year expansion and modernization program, which included installation of five large compressors and three evaporative condensers. For details and pictures, see article on page 24.

**SNOW ICE** in July again helped Weiner's clothing store in Portland, Oregon to sell topcoats in mid-summer. This is the third year this advertising stunt has been used. For details see story on page 49.

**THE** 1956 pack of frozen green peas skyrocked to a new high of 352,215,604 pounds, an increase of 52 percent over the 1955 pack. A spectacular increase in western production, 79 percent greater than last year, was largely responsible. The pack in that region alone, principally in the three Pacific Coast states, was greater than any previously reported United States total pack.

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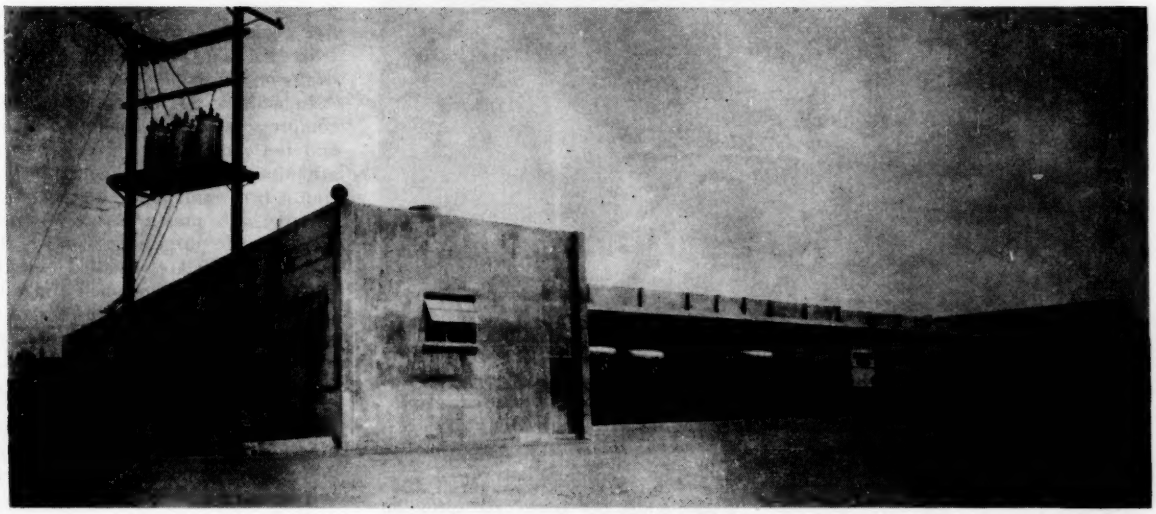
# *For Frozen Food Storage*

## Safeway Stores Opens Refrigerated Warehouse



*Frozen Foods Warehouse, Safeway Stores, Inc., Los Angeles.*

INCREASING demands of the frozen food market in Southern California have made it necessary for Safeway Stores to build their own frozen food warehouse in Los Angeles. This one-story building is 210 x 51 x 16 ft. high and contains 31,500 cu. ft. of freezer storage space. The general construction is of the latest type, using tilt-up precast concrete slabs.

This latest unit in Safeway's Los Angeles installations is not only the most modern in architectural and structural design, but in mechanical design as well. In addition to being a 100 percent palletized storage operation, there is incorporated a mechanical double conveyor that transfers the food orders from the center of the storage area all the way to the interior of the refrigerated trucks located at the receiving docks. Each Safeway truck has its own refrigeration unit and they are well precooled before loading.

### Warehousing Operations

Before receiving any merchandise to be loaded in the warehouse, it is inspected and temperatures are taken to make sure the frozen food is in proper condition. Each item received

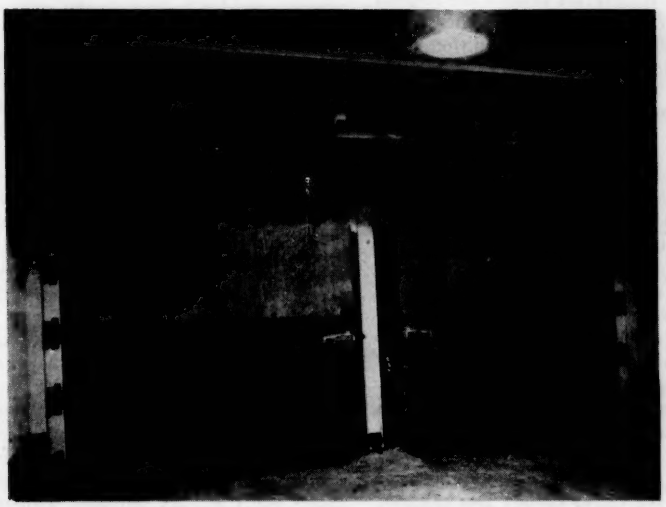


*Fig. 1—Arrangement of air cooling unit in vestibule access to frozen food storage. Low temperature refrigerant is employed to freeze-out moisture moving through the doors during entry and egress. Air unit is defrosted periodically. Doors open into vestibule, further assisting in ice and frost reduction.*

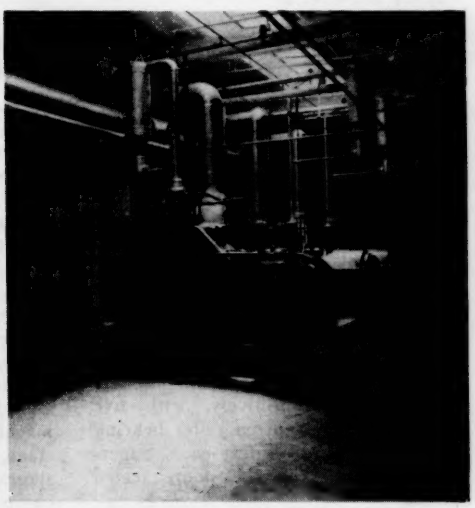


*Fig. 2—Compressor plant for Safeway Stores Frozen Foods Warehouse consists of one 8-cylinder VW booster (foreground) and two 16-cylinder VW high-stage units. Intercooler is at left.*

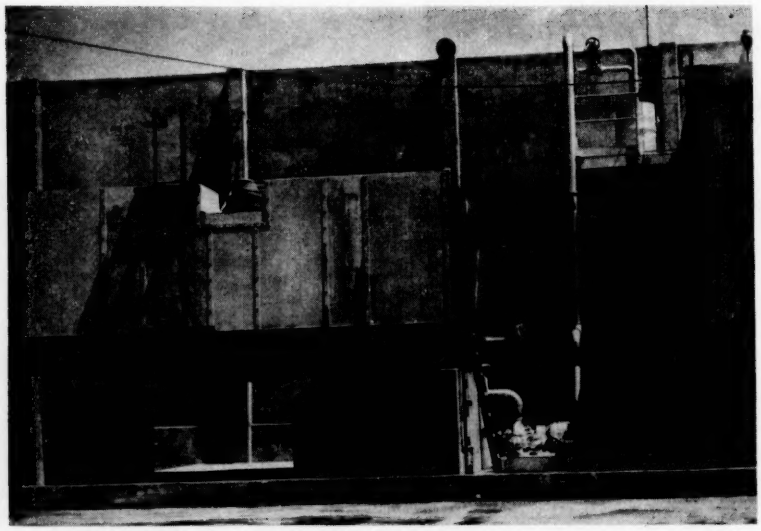


*Fig. 3—Redwood, cement-asbestos and galvanized steel accessories add to the long life of the low-head induced draft cooling tower pictured. Pump in foreground circulates tower water over condensers while pump in background returns the water to the tower.*

is palletized and the date of receiving is put on each pallet to insure the proper rotation in the warehouse. A code number is also put on each pallet so that the product can be spotted in the proper location in the storage.

There is a spur track in the rear of the building to unload two refrigerated cars simultaneously. Employees who work in the freezer storage rooms are equipped with the latest insulated suits and boots. The suits only weigh 39 ozs. There is a rotating system among the employees so that the maximum limit of working in the cold space is only two consecutive hours at a stretch.

### Vestibule Conditioning

To prevent excessive moisture from getting into the main storage room, small ceiling units were installed in the vestibules to dehumidify the infiltrated air (see Fig. 1). These units were equipped with automatic defrosting devices to eliminate excessive maintenance.

Superfreezer overlap doors entering into the freezer room vestibules are arranged in pairs (as shown in Fig. 1), and swing into the intermediate space. Doors are Butcher Boy, 8 x 9 ft., single hung, left and right hand respectively, with five heavy duty galvanized roller bearing thrust, butt-strap hinges each. Superseal closers keep the doors sealed tight.

Two features are added to this door line for the low temperature and oversize opening requirements of the Safeway job. An additional hinge and turnbuckle arrangement each, assists in carrying the weight of these doors, while the jambs are equipped with an adjustable thermostatically controlled heater to prevent condensation on them and subsequent door freeze-up.

Wilson Kenny, the plant manager, stated that the volume of frozen food handled is approximately 220,000 lbs. every week and this amount is increasing each month. It is just a question of time until additional space will be required. The Safeway Engineering Department already has planned for this increase. In fact, the refrigeration system now operating has a capacity for double the present area by merely adding another booster machine and four additional air handling units.

### Refrigerating Plant

The refrigeration system is designed to maintain automatically year round temperatures within the storage space of minus 12 F under maximum loading conditions and with a design 90 F outside temperature. To do this, it was necessary to go to compound compression. An 8-cylinder 6¾ x 5-inch York 75 hp ammonia compressor was selected for the first stage (see Fig. 2) and a 16-cylinder, 3¾ x 3-inch, York 125 hp machine was selected for the second stage, with intercooling between stages. An additional 16-cylinder machine (see Cover photo) was selected for standby operation in the event of machine failure of one of the other two machines.

Four large industrial dry surface type, vertical floor mounted, air units were selected for the freezer storage area with each unit having a capacity for circulating 22,000 cfm. The air distribution from each of the air units is accomplished by means of a slotted duct with adjustable outlets. Experience shows there is less than a 1° F variation throughout the entire room and the low air velocity from the slots eliminates excessive drafts on the employees.

In addition to the three ammonia compressors in the machinery room and the interstage intercooler, there are also installed a vertical suction trap, two ammonia recirculating pumps, high pressure receiver, and an automatic purge unit. Outside the building, there are installed two 28-in. x 14 ft. open type shell and tube condensers, four condenser water pumps and a low head Marley induced draft cooling tower (Fig. 3).

### Capacity and Protection Controls

Believed to be among the more progressive designs in this plant, is the unique application of a complete automatic control of the first and second stage ammonia compressors. With four steps of capacity on the low stage and four steps of capacity on high stage, the steps were staggered so that actually eight steps of capacity are realized. This flexibility of capacity takes care of the maximum demands of summer operation and the minimum demands of winter use without shut down of auxiliaries or changeover to single compression.

The gaugeboard and control panel incorporate pilot lights to indicate the steps of capacity in operation, and a recording pressure controller has been provided to operate the solenoid capacity reduction devices on the compressors proper. A recording temperature chart is kept daily on a 24-hour basis to make a permanent record of the storage temperature throughout the year. In addition to the high and low pressure cutouts of the compressors, the intercooler and the vertical suction trap are equipped with high liquid level alarms in the event of float failure. Alarms also serve to render plant inoperative under such failures.

A maintenance contract was entered into for maintaining the complete refrigeration system the year round. In addition to the periodic monthly inspections and any emergency service, York also provides for manually defrosting of the four air units every Friday morning. Outside of this weekly defrost, it is truly a complete automatic freezer storage plant and Manager Wilson Kenny can say as far as the refrigeration is concerned, "Look, Ma, no hands!"

# The Radiation Preservation of Foods

## U. S. Army Panel Discussion on Current State of Radiation Research - Nature of Process - Effect on Foods - The Future

A U. S. ARMY panel discussion on radiation preservation of food was held at Washington, D. C. participated in by leading army experts from the Office of the Quartermaster General, the Department of the Army, and the Surgeon General's office. These members of the panel made statements, bringing all pertinent information on the subject to date.

## Nature of the Radiation Process

**CAPT. REUBEN POMERANTZ.**
**Radiation Sterilization Officer**
**Quartermaster Food and Container Institute**

I AM certain that one of the foremost questions in your minds is "When can you anticipate the purchasing of foods which have been preserved by ionizing radiation?" This question is not an easy one to resolve, and even though there have been many estimates publicized recently, our own crystall ball has not as yet provided a concrete answer. It is our concerted feeling, however, that before too many years go by, one of the significant applications for the peacetime utilization of the atom will be in the preservation of foods. This will obviously be a major contribution when we realize that food processing is one of our nation's largest industries, amounting in annual sales to approximately $60 billion. Even if only a minor fraction of the total food requirements is eventually preserved by radiation, it will be of major consequence.

The revolutionary process of radiation preservation employs a new form of energy nuclear or atomic energy instead of heat to destroy the microorganisms which promote food decomposition and spoiling. Since in this atomic process there is only a minute rise in temperature in the treated product, during the short exposure time of seconds or minutes, this method is often referred to as "cold preservation."

### Cause of Spoilage

As you are aware, the principal cause of food spoilage is the growth of insects and microorganisms. In frozen foods, preservation and protection is affected by slowing the activities of these organisms. In the conventional canning methods, the food spoiling organisms are destroyed by heating. In this process the food is often subjected to high temperatures, under pressure, for periods in excess of an hour. In radiation, as mentioned previously, there is almost no heating and the particular rays used can be either the beta or gamma type. The samples are exposed to these invisible penetrating rays and, through this penetration, the microorganisms are either killed outright, or their internal functions are so disrupted that they can no longer reproduce, and we eventually end up with a preserved product which can remain fresh for extended periods of time. Thus, if the food sample has been pre-wrapped before exposure to the rays, to prevent re-infestation by insects and microorganisms, it will remain preserved in the fresh form just as is now possible in your freezer. The principal distinction, however, is that with irradiation, foods will require only a minimum of refrigeration and many of them may not require any at all.

Other thoughts that I am certain are passing through your minds at this time are: Why is the Army conducting this program? Will the Army, or perhaps another government agency, be the one to produce and sell these foods?

Our crystal ball is very clear on this subject. The answer is definitely no! The Army is in the program because no single component of the food industry could undertake such an expensive program, requiring the expenditure of millions of dollars; and, since thes Army is concerned with all phases of the food industry, it was only logical that we act as the coordinators and developers of this entire program. But I do want to emphasize that we are not doing this alone we have the extensive cooperation of the non-military government agencies and with the academic and industrial world.

First, within the government, we are cooperating very closely with our other military services the Navy and the Air Force. The Atomic Energy Commission is also cooperating in providing the many sources of gamma radiation. The Department of Commerce, who, through programs such as this one, and through their numerous publications, keeps you and industry fully abreast of our activities. The U. S. Department of Health, Education and Welfare, through the U. S. Food and Drug Administration, is participating.

### Other Sources Cooperate

In addition to the governmental organizations, we are working very closely with many of our country's leading academic and non-profit research organizations. At present over 40 to 50 groups are cooperating extensively in our program and these organizations are spread throughout the country.

Last, but certainly not least, we are keeping our program in close contact with the food processing industry. Recognizing that you will eventually be purchasing your irradiated foods from our large family of food processors, we have realized the importance of keeping industry fully informed so that they will develop the technical "know-how" to undertake the full-scale production, once the process has been proven a success.

We are now working closely with many of our leading food processors and our plan is to expand our industrial cooperative program to an even greater extent this coming year. This then is the real answer to your question as to who will be furnishing you with your radiation preserved foods of tomorrow, it will be your corner grocer or supermarket who has been supplied by our great food industry, one with which we all deal daily and one in which we can all take great pride. Food preservation may also provide a significant contribution to our agricultural economy, for the arrival of the atom on the farm may well result in the production of better foods on a more economical basis.

The sources of radiation to process the amount of foods which will be required will be produced by another important and expanding segment of our nation's industry the new atomic energy enterprises and again, we have every reason to be proud of this newly formed industry, since it is rapidly setting the pace for the President's Atoms for Peace Program.

# Current State of Radiation

LT. COL. TRUMAN F. COOK
Office of Chief Research
and Development
Department of the Army

SINCE the turn of the century, radiation has been used mainly in medical diagnosis and therapy. More recently, an expanding nuclear industry, producing large amounts of radiation, has intensified the search for useful applications of this new source of enegry. It is not surprising that the next useful application should come in the field of food preservation.

Eventual success for this process depends upon the effective marriage of two widely different technologies, food processing and radiation sources. The food industry is old and well established, and, therefore, must be conservative in making radical changes; while the radiation source industry, which does not have a large capital investment, can accept changes readily. The rate of progress, is likely to be governed by the rate of change within the food industry. There is another and most important factor which will control the rate of progress, consumer acceptance.

Even though the program is in the applied research stage, we see no major technical obstacle in placing this method of food preservation into the economy at an early date. This confidence stems from the results of many university, research laboratory and industrial contracts.

I should not convey the impression that all problems have been solved. On the contrary, rapid progress in the food research aspects of the program has sharpened the need to accelerate research efforts in other areas, such as radiation dose standards, packaging materials, and the effect of storage conditions on food quality.

Let us examine where we are from the point of view of the two principal technologies involved. First, food —

There are four prerequisites that this method of preservation must satisfy:

1. The treatment must in fact kill the germs in food.

2. The irradiated food must be wholesome.

3. The treatment must not adversely change the color, odor, taste or texture of foods.

4. The process must be economically feasible.

Let us see where we stand on these four points.

## Killing the Germs

There is no question but that radiation will in fact kill all the microorganisms found in food, provided enough radiation is used. The amount of radiation required to produce an effect varies with the specie, with man being the most susceptible and bacteria the most resistant. For the same organism the lethal dose may depend upon the conditions of irradiation. In general we are fairly certain of the following radiation dose requirements:

a. At 12,000 reps: potatoes and onions are inhibited from sprouting.

b. At 30,000 reps: trichina worms, insects are killed.

c. At 200,000 reps: most micro organisms are killed, pasteurization.

d. At 2,000,000 reps: the most resistant of bacteria are killed, sterilization.

For comparison purposes only, at 500 reps, 50 percent of exposed personnel would be killed.

## Food Must be Wholesome

We are reserving final judgment on the wholesomeness of irradiated food until much more information is accumulated. This conservative attitude is due to the potentially sizeable fraction of our diet which may be irradiated, when the process becomes successful. From the data available, we can state that, the treated foods do not become radioactive, they are not toxic or harmful and are often more nutritious than foods treated by other preserving methods.

## Must Not Change Color, etc

We find that foods respond individually to radiation by changes in color, odor, taste and texture. Milk, for example, will develop undesirable flavor changes at 100,000 reps while dried prunes will withstand 3,000,000 reps without change. For doses up to 30,000 reps needed to kill such things as trichina, insects or liver flukes, only very few foods are adversely affected. For the pasteurizing dose of 200,000 reps we find:

*Acceptable*: Luncheon Meats, Pork, Ham, Carrots, Coleslaw, Peas, Mackerel.

*Need further research*: Bananas, Crabmeat, Oranges, Strawberries, Butter, Milk, Cheese.

For the sterilizing dose of 2,000,000 reps we find:

*Acceptable*: Asparagus, Bacon, Beef Liver, Broccoli, Chicken, Codfish Cakes, Corned Beef, Halibut, Ham, Pork, Pork Sausage, Sweet Potatoes, Waffles.

*Need further research*: Beef, Lamb, Mackerel, Cabbage, Frankfurters, Spinach, Veal.

## Economic Feasibility

Economic feasibility is somewhat a matter of conjecture at the present time. This is due to uncertainties surrounding the cost and capacity of radiation sources which will be required in commercial practice. There is at present no reliable experience upon which to base firm economic estimates. The best present estimates for different types of treatment techniques are as follows:

To *stop* sprouting in potatoes or onions, .03 plus or minus .02 cents per pound.

To *kill* insects in grain, .06 plus or minus .02 cents per pound.

To *sterilize* meat, 3 plus or minus 2 cents per pound.

These costs will drop and the range rapidly reduce as we develop better methods for producing commercially acceptable radiation sources. This makes a fitting introduction to the next subject, radiation sources.

## Radiation Sources

The radiation sources may be of two kinds: reactors using nuclear fuel which produce gamma rays or electron generators which produce beams of electrons. The types of sources which are available are fairly clear to the food industry. What is uncertain are the respective speed of development, convenience of use, and economics.

The electron generator industry appears capable of constructing any number of machines at the desired operating ratings if orders were placed today. Electron generators have the advantage of portability, low operating cost, high efficiency, and do not use fissionable material. However, they are limited to treating foods processed in slabs such as bacon, steaks, fish fillets, cheese or grain. Electron generators appear to have the best application to foods which have a seasonal or transient processing cycle and relatively low volume at any one location but are not necessarily restricted to such use.

For gamma radiation it appears that reactors are the most feasible

It can be shown that specially designed reactors can be constructed to irradiate food and the heat thrown away and still prove to be a profitable venture. This need not be done since the surplus heat can be used for space heating and low pressure steam, both required in food processing plants. Reactors for the food industry appear to have the strongest application for those foods which are brought to central location for processing in volume, such as meat, poultry, fish and possibly grain or for large packages such as roasts or quarters.

The development of atomic power currently is confronted with the problem of high costs. The radiation processing of food may provide ancillary income through the proper use of gamma rays which at present are by-product waste. This could decrease the price gap between nuclear and conventional sources of electricity. Recently we have been approached by a commercial reactor group with a proposal to insert design modifications in their power reactor to provide radiation services.

Other groups are offering power reactors whose over-all economies could be improved if the design incorporated radiation production for food and other materials. It is our opinion that multi-purpose reactors should be built to bring about an earlier realization of nuclear electricity competitively with conventional electricity and at the same time give rise to a brand new and desirable industry.

These reactors are not presently available; however, the President's announced release of 40,000 kilograms of U235 for reactor development and the indicated profit incentive to go ahead should do much to induce industry to proceed with commercial development.

From a management point of view, we are at an important juncture. Our objective has been to execute this program in such a manner that military needs are met while at the same time this process can be introduced into the national economy. Several guiding principles were established early to accomplish this objective. The project has been maintained unclassified. A conscious effort has been expended to print results in technical publications and release information to the press and industry. A maximum amount of the work is done by contract. We have entered into several mutually beneficial no-cost agreements with interested commercial organizations. We have negotiated a logistic and economic feasibility contract with a major company to make a continuing analysis of the process indicating in what manner and at what time profit incentives might be expected to replace Government subsidy.

It has been the Army's considered opinion that a broadened program in radiation preservation of food in industry and Government will provide for a much faster rate of progress, represent a significant contribution to the Nation's atoms for peace effort, utilize more effectively the combined technical talents of other agencies and insure a rapid but planned transition of this method of food preservation into the industrial community.

In order to accomplish this objective, an Army briefing team made presentations to the Atomic Energy Commission, Department of State, Department of Commerce, Department of Health, Education and Welfare, and Department of Agriculture. There were two beneficial returns from these briefings. The Atomic Energy Commission approved the initiation of a reactor development project which will make available in October 1958 what we believe will be the world's first reactor designed specifically as a radiating facility for food. Each department indicated a willingness to participate in the plan.

# The Effect of Radiation Sterilization on Wholesomeness of Foods

**H. F. KRAYBILL**
**Army Medical Nutrition Laboratory**
**Medical Service Corps**

WHILE radiation sterilization has become widely recognized as a promising new method for preservation of foods, it is obvious that before such a process, or irradiated foods, can be widely accepted such type foods must be proven safe for human feeding. To this end, the Office of the Surgeon General, Depart- of the Army, early in 1954 initiated studies under research contracts at various universities and research institutes relating to the determination of the wholesomeness of irradiated foods.

During the past year a broad research program in this field has been supported at thirteen universities and privately sponsored research institutes and at the Medical Nutrition Laboratory, Fitzsimmons Army Hospital, Denver, Colorado. The Food and Drug Administration of the Department of Health, Education and Welfare has worked closely with the Office of The Surgeon General in the design of certain experimental phases of the broad program. The Meat Inspection Division of the U. S. Department of Agriculture has also been apprised of the progress in the program.

Wholesomeness studies encompass at least three areas of interest: (1) Nutritional Adequacy, (2) Toxicity, and (3) Carcinogenicity. It is difficult to separate these areas experimentally, but for definitive information they must be treated separately.

## Feeding Experiments

The possibility of induced toxicity through irradiation is usually investigated by conducting short-term feeding experiments on such foods, with experimental animals and human test subjects and finally any obscure toxicity is determined by long-term animal feeding experiments. In order to insure against the possibility that such foods may not provoke any spontaneous tumor formation or carcinogenicity, these products are likewise thoroughly tested on several animal species (the rat and mouse) by several techniques which include oral feeding, painting, and injection of extracts of such foods on these test animals.

Since March 1954 short-term feeding experiments on irradiated foods have been conducted at three research institutions. After eight-weeks feeding of these foods to rats and having obtained toxicity clearance on the basis of negative findings (based on growth of animals and food consumption) these foods are then tested by a palatability panel at the Quartermaster Food and Container Institute for the Armed Forces in Chicago, Illinois. Acceptance of irradiated foods by this palatability panel permits these foods to be actually tested on human subjects at the Metabolic Ward, Medical Nutrition Laboratory, Fitzsimmons Army Hospital in Denver, Colorado. From this thorough screening program forty-four foods have been tested and thirty-nine irradiated foods have been cleared. Foods similar in composition and type have been cleared by extrapolation providing a list of an additional fifty-nine irradiated foods.

Some long-term feeding experi-

ments completed and others now in progress at several universities on such irradiated foods as organ meats, butterfat, pork and beef, have indicated that these foods can be satisfactorily fed at high levels in the diet to successive generations of rats with no adverse effect on growth or food consumption. A ration composed entirely of irradiated foods has also been fed through several generations of rats with no untoward effects with the only possible minor defect shown of slightly decreased lactational performance of female rats fed the irradiated ration.

Other studies are being carried out in the program to determine the effect of feeding irradiated foods to experimental animals on their reproduction, lactation, and longevity. These experiments have been conducted on rats, mice, chickens, and dogs with no ill effects reported from feeding irradiated foods. Irradiated ground beef has been fed as 50 percent of the calories in a ration to female beagle pups for over eight months without any observed differences in growth rate or food consumption.

As mentioned previously, certain extracts of irradiated foods which are high in certain compounds believed to be potential carcinogens (cancer producing) have been fed to rats and also painted on and injected into the skin of mice without any evidences of tumor formation.

The use of ionizing radiations in processing of foods has a somewhat negligible effect upon the nutritive properties of fats, carbohydrates, and proteins. The energy value of most foods remains unchanged. While meat and lima bean protein have essentially the same biological value (that is, the amount of utilizable protein) after irradiation, milk and pea protein are slightly less in amount of utilizable protein after radiation sterilization, even slightly less than that of the canned product.

### Effect on Vitamins

Several investigators have demonstrated that the fat soluble and water soluble vitamins have been slightly destroyed by "cold" sterilization. It is interesting to note that whereas vitamin destruction may be rather extensive in pure solution, in natural or complex foods that degree of destruction is much less. Certain protectors in foods make the vitamins more radioresistant. By actual chemical analysis and through feeding experiments these vitamin losses have been determined and it is significant to report that by comparison the heat treatment of foods effects a greater loss in vitamins in general than the radiation sterilization treatment.

Since the subtle nature of the changes brought about by irradiation requires many techniques to prove the presence of any irradiation end products, similarly the feeding experiments with animals must be exhaustive and continued through longer feeding periods to insure that foods sterilized or preserved by ionizing radiations may be safely consumed by human populations.

When the more promising irradiated foods have successfully passed the animal feeding tests and palatability panel evaluation at the Quartermaster Food and Container Institute, they are put to the final test on human test subjects at the Medical Nutrition Laboratory as previously mentioned. Here the effect of feeding such foods is followed closely with the view toward determining any possible toxic effects from ingestion of these foods for at least four weeks as well as obtaining information on actual human acceptability of irradiated foods.

You may be interested in knowing that the human volunteers are Mennonites or conscientious objectors conscripted for two years in lieu of military service. Much credit is due to the Colorado State Selective Service, the National Selective Service System, and the Mennonite Church in Denver, for making these volunteers available. The volunteers have been extremely cooperative, enthusiastic in this work, and their contribution is of great importance in this national program.

Irradiated foods have been fed to these human test subjects at levels of 35, 65, and 80 percent calories in the diet for as long as four weeks with no toxic effect. Experiments are in progress in which 100 percent of the calories in a diet are furnished by irradiated foods.

For all the foods tested the human test subjects have found the irradiated foods as acceptable as the non-irradiated foods. There are, of course, some exceptions such as irradiated powdered milk and strawberries which in first tests were not as well received as the untreated products. Through all these tests no evidence of residual toxic effects from the consumption of irradiated foods has been reported. Work is continuing with future plans being concentrated upon longer term feeding of irradiated foods and the critical testing of irradiated foods that have been stored at 70 degrees F. for 3 to 6 months.

Should the data and findings from continued experiments prove as satisfactory as those in the previous work, the forecast of the radiation sterilization and preservation process for the future may be successful.

## Future Potentialities For Radiation

**COLONEL WILLIAM D. JACKSON,**
**Research and Development Division**
**Office of The Quartermaster General**

UP TO now you have been hearing about the background and the present status of the technical state of the art. Let us now review our current estimates on the state of promise of the potential applications of food irradiation.

First, decrease of food losses by insect control holds good promise. There is no question that we can destroy insect life without adversely affecting the taste of most foods. You are all familiar with the beetles that show up in packages of flour and corn meal. How many times you have had to discard batches that were infested with those crawling things. Most of these insects come from tiny eggs or larvae in the flour or corn meal that have come along from the mills, warehouses or other places of storage. If the boxes of cereals, flour, etc., can be irradiated with a low dose of rays, the insect life would be destroyed and no longer would there be any worry about bugs in our cereals, flour, spaghetti, noodles, etc.

Second, there is a distinct possibility of improved flavor and texture of today's canned goods. In the conventional canning process, the food is placed in the cooker at 240F up to over an hour in order to kill the bacteria. It is this prolonged heat that gives our canned meats their characteristic texture and taste. In the irradiation process, the food can be sterilized by being subjected to the rays only for a short time. There is only a few degrees rise in temperature. There is no over-cooking. The canners can then heat the contents only to the optional level and let the housewife finish the cooking to just the right degree when she warms it up at home.

### Variety Increase

Third, we can increase the variety in our food selection. For example

quite a few of the tropical fruits are not permitted entry into this country, because of infestation with insect pests, and plant diseases which may spread in our own agricultural crops in this country. The fact that insect and plant disease destruction can be attained at relatively low radiation doses, makes it highly probable that the quarantine can be lifted for irradiated tropical fruits.

Fourth, irradiation sterilization may decrease cost in food handling. When potatoes and onions are subjected to low doses of irradiation, the sprouting is inhibited and storage life can be extended from eight months to fifteen months, thereby spreading the year's crop over a longer distribution time.

If we give foods, prepackaged like the luncheon meats and bacon we find in the grocery store, a low irradiation treatment, we would be able to extend their shelf-life in the refrigerator five times or more in some cases. You all recall many cases of having to toss out bacon, for example, because of the development of bacteria and mildew. Now a slight irradiation treatment will enable us to keep our bacon, cole slaw, frankfurters, salami, luncheon meats, scallops, hamburgers, and other foods in the refrigerator for a much longer time. This will be very convenient for the housewives who shop for groceries for a week or two or more at a time.

Also, if we give a much higher dose of rays to the prepackaged fresh pot-roast beef, or steaks, we would be able to keep the fresh meat without refrigeration for months and months, inasmuch as all of the decaying and spoilage bacteria are killed and the beef is safe from their attack.

### Wider Distribution

Fifth, wider distribution of perishables will follow naturally when there is decreased cost in food handling. One cannot help but think what this can mean to the millions and millions of people throughout the world. As you know, over half of the world is not receiving an optimum diet, even though food surpluses may exist in other parts of the world. At the same time, there are twenty million more people coming into the world each year. Many millions of these good people do not have the refrigerated facilities, with which we are blessed in this country. With the irradiation treatment, we can envision how for once there is a bright ray of food sunshine for these people, whereby fresh meats and foods from far-off lands can be irradiated and shipped to them. The reputation of our country as a humanitarian nation would be greatly enhanced. Our agricultural trade would be increased at the same time. Thus, irradiation of food is truly one of the most decidedly peaceful uses of the atom, a program advanced and supported by both our President and our Congress.

### Control of Diseases

Sixth, we can expect considerable help in the control of certain diseases. Let us take the example of trichinosis. This disease is caused by a tiny worm, called trichina, which is found in pork from some hogs. These worms or their eggs lodge in the meat itself and infect man, who happens to be so unsuspecting as to eat an incompletely cooked piece of contaminated pork. This is why, of course, pork chops are always supposed to be served well-done. However, it so happens that, in this hurly-burly rush of the competitive world, some people cannot wait long enough for the chops to be well done, leaving small portions uncooked in the center. If the pork is contaminated, he stands a good chance of contracting trichinosis. There are many people in this country with it. Even though it is seldom fatal, nevertheless, it is a rather debilitating illness.

For this reason, any help in controlling this disease would be a godsend. This is how irradiation comes into the picture. If the pork is subjected to a low dose of rays, all of the trichina worms and bugs would be destroyed, the pork would be otherwise as fresh as ever and the housewife would not have to worry whether the already burned pork chop might still have a wee bit of rawness in the very center. If the irradiation is applied universally, we may well eliminate trichinosis as a disease in this country.

Higher doses of radiation will destroy the pathogenic salmonella bacteria in eggs without any undesirable flavor changes. Liver flukes in fresh fish can be killed by irradiation.

## Air Conditioning Standard For Multi-Zone Buildings

A NEW application engineering standard for air-conditioning multi-zone buildings, such as factories, office buildings, and similar structures in which varying degrees of cooling and humidity must be maintained, has been issued by the Air-Conditioning and Refrigeration Institute. It is limited to the setting of minimum conditions and factors that form the basis of design load estimating and specifications of performance for such installations.

### Standards Revised

In effect a complete revision of a standard issued in 1947 by the Air Conditioning and Refrigerating Machinery Association, a predecessor organization of ARI, the new document is designated as ARI Standard 530. It represents fulfillment of a long-sought industry desire to systemize application engineering of air-conditioning installation. To commercial and industrial building owners, consulting engineers, and architects, who contemplate air-conditioning for themselves or their clients, the new standard will provide a working tool of value, it was pointed out by ARI.

Among the factors and phases of estimating loads and setting performance specifications covered in the new ARI Standard 530 are:

(1) Design load factors for inside and outside conditions, (2) Sensible heat gain through glass, (3) Transmission, (4) Heat gain from occupants, (5) Heat gain from appliances, (6) Ventilation and infiltration, (7) Air motion in conditioned spaces, (8) Capacity specifications, (9) Cooling load calculations, (10) Multi-zone building refrigeration loads, (11) Heating load calculations and (12) Safety provisions.

The new standard includes a new and more comprehensive cooling load estimate form, and embodies new factors, as enumerated above. A major addition is the inclusion of factors and instructions for calculating the total refrigerating load in multi-zone buildings.

Developed by the engineering committee of ARI's Air-Conditioning and Refrigeration Systems Section, the final standard is based on the experience and knowledge accumulated by the ARI member companies which manufacture and sell air-conditioning equipment from 20 to 1,500 horsepower. These member firms include American Blower Corp., Brunner Manufacturing Co., Carrier Corporation, Airtemp Division, Chrysler Corporation; Frick Company, The Trane Company, Vilter Manufacturing Company, Westinghouse Electric Corporation, Worthington Corporation and York Corporation.

Copies of ARI Standard 530 may be obtained from the Air-Conditioning and Refrigeration Institute, 1346 Connecticut Avenue, N.W., Washington 6, D.C.

# Icing Cod with Salt Water Ice

PAUL HANSEN

Technological Laboratory
Ministry of Fisheries
Copenhagen, Denmark

IN 1954, the Technological Laboratory of the Ministry of Fisheries, Denmark, undertook a pilot scale investigation of the use of salt water ice for the icing of "wet" cod. It is obvious that such an investigation is of great importance to coastal localities where fresh water for the manufacture of fishery ice is scarce. It was thought that the salt water ice might also prove useful in the general handling and shipping of fresh fish and fishery products as it might delay spoilage because of the low melting temperature. Such an effect had been reported in publications from France and the U.S.A. From other sources, however, warnings were given that sea-water ice would give initial melting temperatures as low as 21 F and that the tissues of fish stored in this ice would be damaged by slow partial freezing.

Table 1. Average Taste Score and Standard Deviation

| Ice (days) | 7 | 9 | 11 | 14 | 17 |
|---|---|---|---|---|---|
| "Sea" water | 7.6 | 7.1 | 6.5 | 5.1 | 3.1 |
| | (0.3) | (0.4) | (0.4) | (0.3) | (0.7) |
| "Brackish" water | 7.2 | 6.6 | 5.8 | 4.3 | 2.2 |
| | (0.4) | (0.4) | (0.4) | (0.5) | (0.6) |
| Fresh water | 6.5 | 5.5 | 5.8 | 4.2 | 1.6 |
| | (0.3) | (0.4) | (0.4) | (0.4) | (0.5) |

Figures in parentheses indicate the square root of the variance of each average score.

Ice was frozen in an Atlas slice-ice machine from (1) ordinary tap water, (2) tap water containing 1 percent sea salts, and (3) tap water containing 3 percent sea-salts.

A quantity of the last-mentioned ice was packed in narrow paper bags and stored for three weeks at 19.5 F, the bags standing upright. Samples of ice taken from the upper part of the bags at intervals during the storage period showed a decreasing content of salt: 2.7, 2.2, 1.8, 1.1 and 0.9 percent. During the storage the bags were seen to moisten at the bottom indicating a slow downward flow of salt brine. Melting temperatures around 23 to 21 F were observed in samples of sea-water ice at the beginning of the melting at ambient temperatures above 32 F. This temperature range corresponds to the freezing point of about 1½ molar solution.

The above observations show that sea-water ice must be regarded as water ice flakes moistened with a more or less strong salt-solution. At the beginning of the melting salt strengths around 10 percent should be expected in the melting water.

Headed and gutted cod, weighing about 2.2 lb each, were divided into three equal batches and iced in ordinary wooden fish boxes with the above-mentioned types of ice: fresh water-, "brackish" water-, and "sea" water-ice, 3 parts of ice to 2 parts of fish being used. Ambient temperatures were regulated between 35.6 and 41 F but the air circulation caused a rather extensive melting. All three batches were therefore re-iced several times at the beginning of the experiment to make up for the ice melted. The brackish and sea-water ice for re-icing were taken from the −7 C room and stored for some hours at 2 to 5 C before being placed in the fish boxes.

Electrical resistance thermometers were inserted permanently for periodic recording of the tempertaures along the backbone of 3 to 4 fishes in each batch. The daily average temperatures are shown in Table 1.

In the fish iced with fresh water ice, temperature of 31.5 to 31.3 F were measured during the whole period of icing. The fish iced with brackish water ice showed temperatures between 31.1 and 30.2 F during the first few days; then there was a fall in temperature to 29.7 F followed by a slow rise to 31.1 F. This latter temperature was reached after two weeks of icing.

Temperatures in the salt water iced fish fell during the first two days until a minimum temperature of 28 F was observed on the third day of icing. From that day the temperatures rose gradually until at the end of the experiment, after 17 days' icing, the remaining fish of this batch showed temperatures around 31.1 F, similar to those of the other two batches. The sea-water ice remaining in the box was found to contain only 0.1 percent salt.

Characteristics of partial freezing, stiffness and ice formation in the tissues, were observed in the fish iced with salt water ice during the periods in which temperatures below 30.6 F were recorded.

### Quality Assessment

No systematic investigation was made on the raw fish, but the general impression was that the fish iced in "sea" water ice were less spoiled at the end of the experiment than those iced with ordinary ice.

At the beginning of the experiment three fishes were divided into ten portions which were cooked in 2 percent salt water and tested by a taste panel consisting of ten persons. The average score for taste was 9.2 and the square root of the variance 0.3. Scores were given according to the Laboratory's arbitrary scale: From 10, ideal; 8, good; 6, fairly good; 4, acceptable; 2, poor; 0, rejectable.

The results of similar periodic testings of the iced fish are shown in Table 1. Within one testing these variances take into account the natural variation between the number of portions from one batch of fish and the variation in personal preference of panel members. The variations, however, do not include the possible bias due to different circumstances between one testing and another.

Remarks given by some testers indicate that slightly "salty" flavors were occasionally noted in portions of fish iced in salt water ice. The texture of these portions was, in some cases, described as "tough". The control portions, on the other hand, were found to be too "soft" by some testers. The average scores for texture, however, like those for flavor (table 1) are in favor of the "sea" water iced fish.

It seems that the overall quality of sea-water iced fish gained more from the delay in spoilage than it lost through partial freezing and salt uptake. In the present experiment, however, the fish were iced with newly prepared, homogeneous salt water ice in proportions much above those used in practical icing of fish. Experiments on a more practical scale are therefore necessary before it can be seen whether salt water ice may be of commercial value to the keeping quality of iced fish.

Complications may be expected due to the downward flow of salt brine during the storage of salt water ice at temperatures that are not ex-

**(Continued on page 51)**

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This paper was presented at an international meeting of fish processing technologists organized by the Food and Agricultural Organization of the United Nations Interim Committee on Fish Handling and Processing, held at Rotterdam, The Netherlands, June 25-29, 1956.

# Automatic Equipment Cuts Maintenance Time In Enlarged and Modernized Beef House

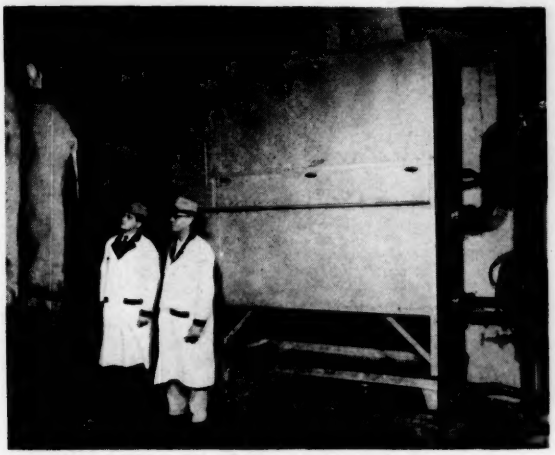


*Fig. 1 — Gus Juengling personnel look over young beef being chilled by new two-speed air unit recently installed. Vilter accumulator floods adequate coil surface, which with back pressure regulator prevents coil frosting and maintains high humidity.*

*Fig. 2 — This view in the Juengling plant is evidence of controlled humidity during chilling of carcasses prior to storage. Gebhardt air units at the ceiling of this sales cooler maintain proper storage temperature and humidity conditions until delivery.*

AN OLD established beef house in Cincinnati, The Gus Juengling & Son Company has recently emerged with an outstanding addition to its old quarters. The company has lived through a period of development in refrigeration that stretches from the use of natural ice brought by canal boats to the era of their present push button plant. They have expanded from the days when all refrigeration was handled by sheer brawn in the form of block ice to the present when it is handled by the flick of a switch.

In the early twenties a large vertical single acting compressor was installed, and the old ice bunker was filled with thousands of feet of prime surface coils, instead of the canal ice. This, of course, was the very latest thing in cooling at that time. In the late thirties these coils were removed and were supplanted by a unit cooler and several overhead cooling units. It was with this equipment that the firm operated until existing sales dictated additional space for chilling, cooler, boning, shipping, and freezing.

Design decided upon was an addition that would make use of existing buildings, and provide for an easy flow of goods from the existing plant through the new to dock facilities in the rear of the new addition. It was determined at the outset to provide a plant that would require as little attention as possible. By the judicious use of standard accessories such as pressure regulators, solenoids, thermostats, and time delay devices, this has been accomplished. The entire plant operates with only ordinary maintenance inspection.

### Beef Chill Room Unit

The beef chill room is cooled by a large flooded finned coiled two-speed air unit operated by a thermostat (see Fig. 1). At no time is defrosting necessary as the unit is sized to operate with high internal ammonia temperature, controlled accurately by a suction pressure regulator. Humidity is kept at a high level in the room by using this small split between ammonia and air temperatures. Even air distribution is obtained by the use of slotted ducts at the ceiling. Shrink has been kept at a very low figure in this room and in the entire plant.

From the chill room the beef is moved to the sales coolers (see Fig. 2). Both the old and the new coolers are refrigerated by Gebhardt overhead units. Again, humidity is controlled by suction pressure regulation. The number of units in these rooms makes it possible to operate with several units off at all times. By alternating the units in operation through the use of solenoid valve, special defrosting apparatus is not required. All units are controlled from a master show the units in operation.
panel in the coolers. Indicator lights

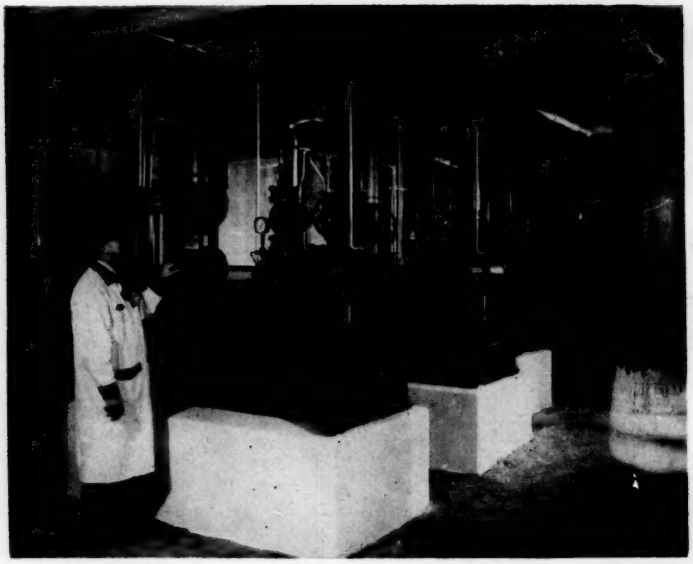
From the sales coolers the sides may move through a refrigerated shipping room to the loading dock or into the adjoining boning room. Thermostats control the overhead units in these two rooms.

### Low Temperature Room

Beyond these last two rooms is a low temperature room in which is located a blast freezing tunnel and storage space for over 100,000 lbs of frozen product. The tunnel, located on one side of the room is operated by a Vilter water defrost finned coiled unit. The large freezer door opens into an ante room which prevents loss of cold air while the palletized meat is being moved into the room for freezing. A small reach in door is provided for loading and unloading of boxed goods. Temperatures of minus 24 F are used for blast purposes, while the room is carried automatically by thermostat at minus 5 F.

All cooling units in the plant are started by controls having selector switches which give a choice of either automatic or hand operation. By means of a master switch located in the basement engine room, all solenoids in the plant may be opened or closed. In addition, incorporated in this master control are selector switches for operating the compressors either by thermostat in any room requiring refrigeration, or by hand.

The compressors consist of two



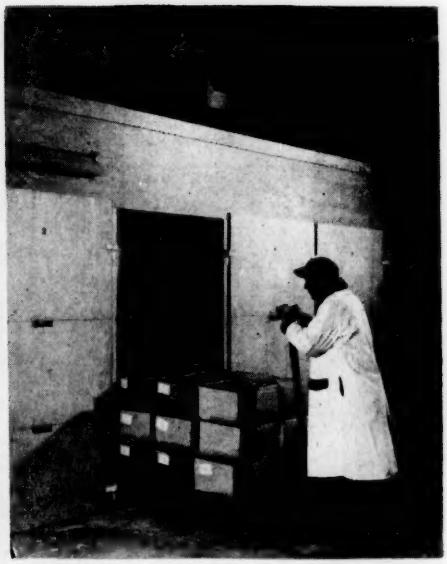


*Fig. 3 (left) — One of six reach-in compartments to the freezer tunnel loaded with product. A water defrost blast unit serves the tunnel which is located in a larger freezer equipped with ante-room access. Fig. 4 (right) — Automatic service for Juengling's refrigerated spaces is provided by two four-cylinder Vilter VMC's. AVMC booster and a VSA unit is behind the second machine.*

Vilter 4-cylinder VMCs; one Vilter VMC booster, and the vertical which was a part of the old plant. By the use of time delay relays, pressure cutouts, and unloading of the VMC compressors, a completely automatic operation of the plant is achieved. It is done in this manner: If temperatures of the plant are satisfied, no compressors operate. Should, for example, hot cattle be brought into the chill room and the thermostat call for cooling, one of the 4-cylinder VMCs will start. At the same time the time delay on the old vertical is energized. If suction pressures remain high after about a two minute pump down period, the vertical compressor starts to assist the VMC. On the other hand, if in this time the suction pressure is reduced to a point which indicates one compressor is sufficient, a low pressure switch on the vertical opens and the Vilter VMC continues to carry the load alone. At present the VMC compressors are used alternately with hand selector switches providing "flop-over" service.

### Insulation

The insulation in the plant consists of four inches of sheet cork in the walls and ceiling of the cooler, boning room and shipping room. Foamglass of the same thickness was used in the floors. In the freezer, eight inches of cork was used to cover the walls and ceiling and 8 inches of foamglass was put in the floors. This insulation work was handled as a separate contract by the Mundet Cork Co., of Cincinnati.

Contract for the refrigeration installation was awarded to C. P. Wood & Company, distributors for Vilter Manufacturing Company in Cincinnati. Cincinnati architects Felsburg & Gillespie designed the new addition.

## New Term Covers Cooling and Heating

BECAUSE an increasing number of manufacturers are offering chilled water cooling equipment for use in connection with hot water heating, the question of finding a suitable term to cover both functions has occupied the attention of the industry. After a careful study of the situation, a committee of the Institute of Boiler and Radiator Manufacturers has come up with the suggestion "liquid heating and air conditioning systems."

The committee pointed out that this name eventually might be shortened to "liquid air conditioning systems." It was further suggested that the industry call itself the "liquid heating and air conditioning industry." The name suggested is sufficiently broad to cover various functions such as heating, cooling, indirect heating of domestic water with the house heating boiler, and snow melting by the use of the heating system.

Four general methods of cooling are available for use in connection with hot water heating, the Plumbing and Heating Industries Bureau explains. In some cases the same piping is used for the circulation of chilled water in the summer and hot water in the winter. The Bureau points out that chilled water cooling can be installed in an existing home equipped with hot water heating as well as in a new home.

## Cites Advantages of Public Warehousing

A LOOK at the costs of public warehousing compared with leasing or building is certainly a must for any company. . ." said George S. Odiorne, chairman, Management Service Section, Rutgers University, in a recent talk at the Packaging and Materials Handling Short Course. Mr. Odiorne then outlined these advantages of public warehousing:

It is often cheaper

The industry provides national coverage.

Shipping costs can be reduced.

Meets the needs of shifting markets.

Only the space and labor used is paid for.

Relieves plant inventory congestion.

Warehousing responsibility turned over to specialists.

Warehouse receipts provide easy inventory financing.

Facilitates leveling of production without expense of space which would be empty part of the year.—NARW Quick Sheet

# Annual Ice Convention Offers Usual Practical Program – November 13-16

THE PROGRAM of the Annual Convention National Association of Ice Industries is rapidly taking shape according to an announcement from the Washington office. The convention will be held at the Atlanta-Biltmore Hotel, Atlanta, Ga. November 13-16.

### Headline Speakers

Headline speakers have been announced for two of the sessions. Boyd Campbell, Chairman of the Board, Chamber of Commerce of the United States, and Chairman of the Board, Mississippi School Supply Company, Jackson, Mississippi will address the Convention on Thursday. L. B. Raisty, vice-president of the Federal Reserve Bank of Atlanta will speak to the Wednesday session. His subject "The Business Outlook for 1957" should be of universal interest to all.

Harold Johnson, nationally known transportation authority, United States Department of Agriculture, Washington, D.C. will discuss refrigerator car and motor truck transportation trends in the years ahead.

Dr. James P. Wesberry, Pastor, Morningside Baptist Church, Atlanta, will give the Invocation.

### For The Ladies

For the ladies a luncheon and tour are offered for the opening day of the convention. The party will motor out Peachtree Road through the red clay hills to Aunt Fanny's for a luncheon of fried chicken, corn pone, and milk gravy. This event is being sponsored by The Greater Atlantic Ice Manufacturers and the Ladies Auxiliary of The Southern Exchange. Thursday these same groups have arranged for a ladies' coffee hour at Rich's, one of the South's finest and most colorful department stores.

### Business Sessions

The business sessions will dig into the basic core of the iceman's interests and problems. Most of those on the program are from the industry, ice men who have the know how. In planning the business sessions they started with the topics that created the most interest at the regional conferences and unit conventions. For each topic an ice man who had done an outstanding job was drafted to tell what he did and how he did it. His discussion of the subject will kick off a full and free discussion by others. In addition to these topics, others may be instituted by members of the convention.

Among the set subjects are: The problems and methods of adjusting the business to meet our shifting markets; selling Ice through retail stores; cutting processing costs through mechanization; new markets; new methods and equipment; selling and promoting our products and our business; the future of truck icing and refrigerator car icing business; operating, promoting and handling truck icing business; consolidation of markets; new slants on vendor sales; and increasing availability through use of manually-operated refrigerated stations.

As usual there will be reports from the officers and association staff which will bring members of the industry up to date on the Association's plans and activities.

### Entertainment

For the entire convention, Wednesday there will be a special tour of the scenic spots of the Atlanta area. Among these will be a stop at Grant Park and an opportunity to view the Cyclorama of The Battle of Atlanta. Another stop will be at Stone Mountain Confederate Memorial being carved across a mammoth vertical background of granite approximately one thousand feet high. The tour will be concluded with a southern barbecue. And there will be the usual colorful dinner-dance and floor show.

### Exhibits

The exhibits this year will have a prominent place in the convention. The exhibit hall of the Atlanta Biltmore it is announced, offers the finest layout for an equipment show of any hotel in the country. New methods and new machines, cost cutting devices and other modern ideas and methods will be shown.

## Delta States Convention

ANOTHER interesting convention is being planned by the Delta States Ice Association to be held at the Arlington Hotel, Hot Springs, Ark., December 2-4. The program, it is promised, will be factual, stimulating and varied.

Among the speakers will be Charles T. Evans, assistant to the president, Arkansas Power & Light Co., and Louie E. Throgmorton, vice-president and director of public services, Republic National Life Insurance Company, Dallas, Tex.

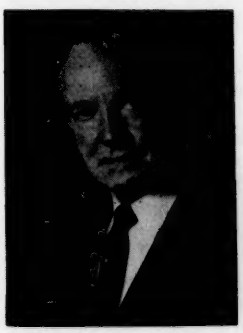
Representing the ice industry will be Guy W. Jacobs, executive secretary and C. P. Austin, director research and marketing, National Association of Ice Industries. Mr. Austin will head a round table conference in which problems of the ice business will be discussed. Emphasis will be on local interests and local problems.

Exhibits will be shown by associate members and special entertainment will be provided for the ladies.

## Tri State Ice Convention

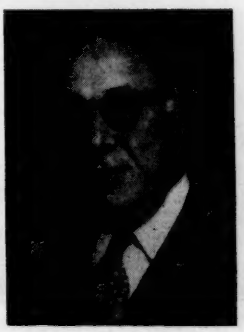
A TRI STATE convention of the Ohio, Michigan, and Indiana Ice Associations will be held at the Detroit-Leland Hotel, Detroit, February 25-27, 1957. A most successful joint convention was held in Detroit last year and it is expected that this year an even larger attendance of delegates and exhibitors will be attracted. Committees from the three associations met in Detroit October 23 to make final plans.

### Headline Speakers at National Ice Convention



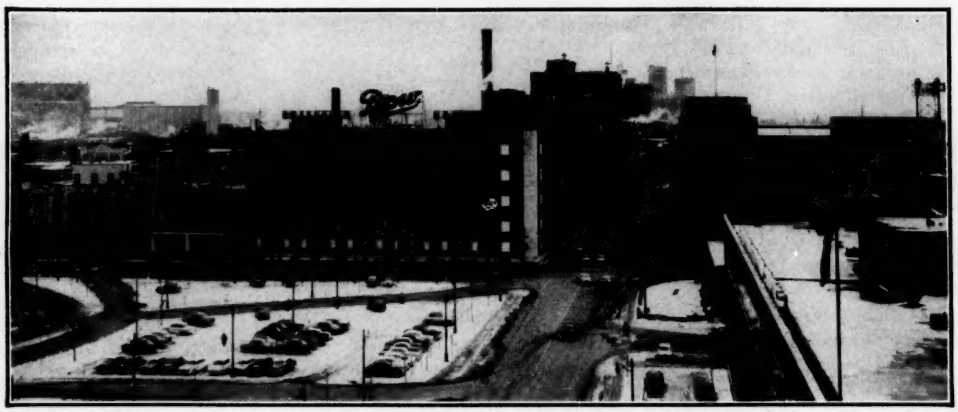
*Boyd Campbell*

*L. B. Raisty*

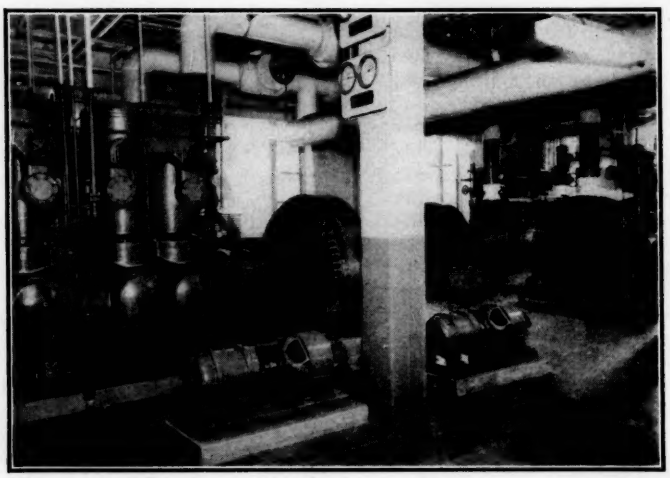


*Harold Johnson*

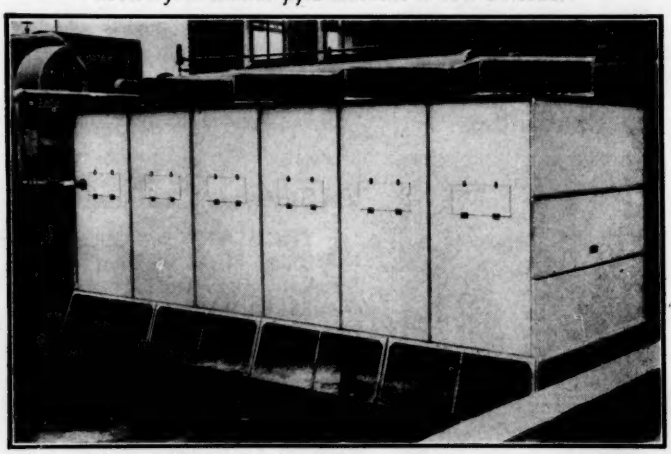
# Special Refrigerating Equipment Provided in Modernization Program of Canadian Brewery



*Seven of Dow Brewery's nine buildings in Montreal. Huge Stockhouse No. 1 is below sign; opposite is Modernistic Bottling House; across street is Dow's Freight Terminal, adjoining that of Canadian National Railway, in foreground.*



*Four large Frick 14 x 12 Four-cylinder Compressors, each with a 450 hp motor, give big tonnages from small floor space at the Dow Brewery. A similar fifth machine is now on order.*



*This Frick evaporative condenser of 333 tons capacity was specially designed to suit needs of the Dow Brewery.*

A THREE-YEAR expansion and modernization program has been completed by The Dow Brewery, Montreal, Canada. This brewery was established in 1790 and has now an annual production of more than one-and-a-half million barrels.

During the modernization program installations were made of four big 4-cylinder compressors, of size 14 by 12; a specially designed evaporative condenser; a 5-ft. by 10-ft. suction line accumulator with two double-stage liquid ammonia pumps; a Frick-Witteman carbon dioxide liquefying system, a 48-in. by 18-ft. receiver, with purger, a 30-inch by 15-ft. brine cooler; and several smaller brine coolers, all Frick equipment.

The compressors are driven by synchronous motors of 450 horsepower, made by Canadian Westinghouse Company. These machines turn at 300 rpm and are operated continuously, day and night, as required. They carry suction pressures varying between 15 and 20 pounds gage.

The evaporative condenser was especially designed to suit the requirements of the brewery, and has a capacity of 333 tons of refrigeration, when handling air at 74 degrees wet-bulb temperature, and delivering liquid ammonia at 93 degrees. The condenser is equipped with two sets of 1-in. coils, operated in parallel, and has four fans, each handling 25,000 cfm. The entire equipment, including the screens and casing, is galvanized, but the water pan, after being sand blasted, was coated with neoprene.

The operation of this condenser proved so satisfactory that two more like it have been ordered.

# Protecting Insulation From Damage by Fork Trucks and Deterioration

P. J. MORRISSEY

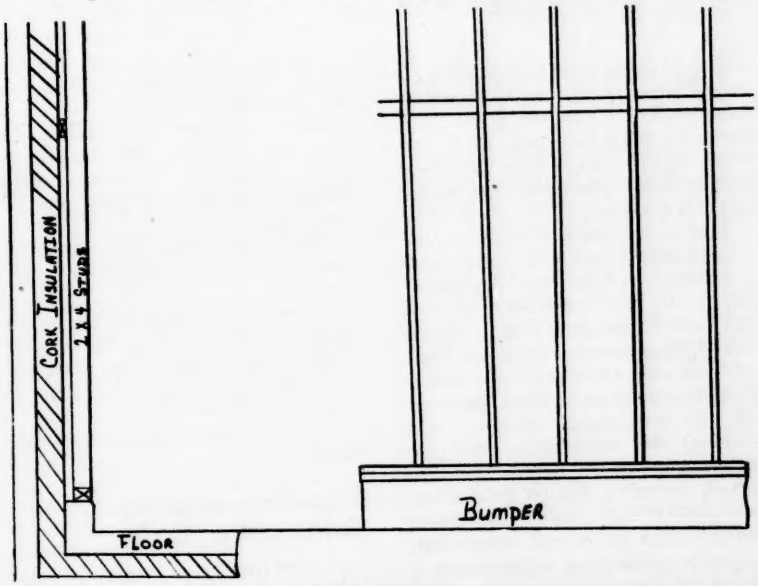
Security Warehouse & Cold Storage Co.
San Jose, California

DURING the past ten years this Company has developed methods of protecting cork insulation from damage by fork trucks inside refrigerated rooms and for protecting the cork pipe covering on insulated pipe lines that are outside the buildings and exposed to the elements.

Our newest freezer storage building has a high ceiling; 23 feet to the bottom of the trusses. The building was insulated with six inches of cork board on the inside of the walls. Had plans not been made to protect this insulation, twenty-three feet of cork board would have been exposed to the abrasion of fork lift masts and pallets. To protect these cork walls the following features were incorporated into the building design:

An eight inch thick by twelve inch high concrete bumper was poured around the perimeter of the building at the same time the wearing floor was poured. The function of this bumper is to keep the fork lift trucks away from the cork and to act as a foundation for a skeleton two by four stud wall to protect the cork at higher elevations. A cross section of the wall is shown in the attached illustration. The cork board itself is not painted or finished in any way. The vertical two by fours have been planned so that they come flush with the door casing. The edge of the two by four stud, the cork, and up to where the door casing begins is covered with galvanized metal to further protect the cork around the perimeter of the doorway.

The two by four stud wall has an added value: it insures a minimum of six inches of air space between the nearest packages of goods and the wall. If a pallet of product were to lean over against the two by fours, there would still be six inches of clearance between the package product and the wall. The two by fours are placed in such a way that good air circulation is assured.




*Cross section of wall showing installation of protective features. Left, typical section; right, typical elevation.*

### Method Effective

This method has proved to be very effective in protecting the cork board insulation. The building has been in operation two years and there has been no insulation damage. In a few instances the two by fours have been damaged but they have done their job of protecting the insulation, and as a bonus feature have insured adequate air circulation at the walls.

Reprinted from NARW Bulletin on Better Warehouse Operations

### Protecting Outside Pipe Lines

In 1949 it was necessary to span a distance of approximately 400 feet with a low temperature suction line. The pipe was to span a railroad track and yard area and continue along the side of a building. The entire 400 feet of pipe was outside, exposed to summer and winter weather conditions on all sides. The problem was to protect the cork pipe covering from the elements.

The cork pipe covering was applied in the usual manner and all cracks or joints were carefully calked with brine putty. The cork covering was then painted with cork paint. The line was covered with aluminum sheeting; all sections were lapped and sealed with calking compound. The aluminum coverings were held in place with stainless steel straps. The entire pipe line was supported with steel hangers, but before the pipe was placed in the hangers, the hangers were lined with heavy vapor-seal paper so that the steel would not come in contact with the aluminum.

After seven years there has been no deterioration of the pipe line in any way. There has been no sign of electrolysis between the aluminum and stainless steel straps or the aluminum and the steel hangers. No maintenance has been needed.

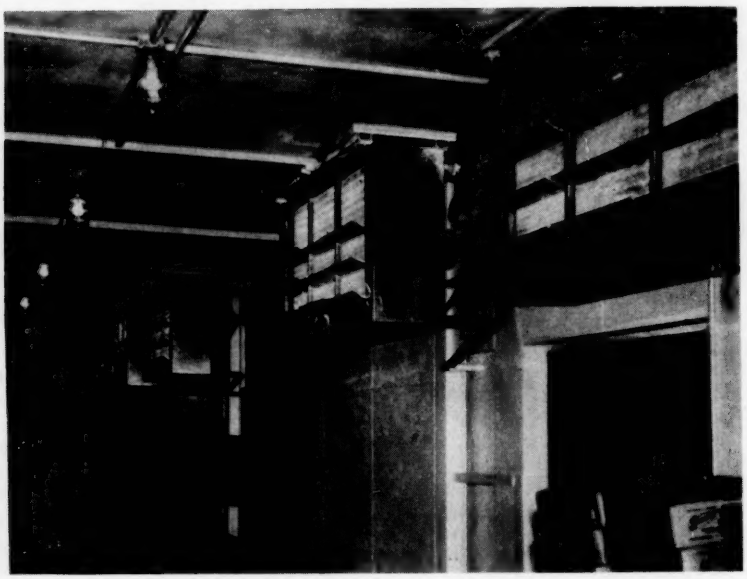
## Relative Humidity Of Sweet Potato Storage

AN RH of 85 to 90 percent for sweet potatoes in storage proved best in studies reported by Ezell, Wilcox and Dameree (USDA, Beltsville, Md.). Low humidity (70-80 percent) caused excessive loss of weight and tended to hasten internal breakdown and shorten storage life. High humidity (95 percent) cause increase in moisture content and is likely to cause surface discoloration and poor appearance, but does not increase decay.

Varieties used in the study were Orange Little Stem and Yellow Jersey. Temp. was 60 F. The tests were conducted following a curing period. Humidity in the range considered (70 to 95 percent) had little effect on the carotene and ascorbic acid content.

These recommendations are fairly close to those of the Commodity Storage Manual which are based on earlier work by Boswell and Lutz, USDA. The later studies extend information on humidity and particularly on the fact that it does not affect vitamin content.—TRRF Bulletin.

# Supermarket Grocery Chain Installs Refrigeration Without Water



*Picture of four Thermobank TV 520 evaporators in the 60 X 35 ft minus 10 F storage room at Standard Grocery Co. Warehouse.*

BASED on the successful application of remote type air-cooled condenser, in more than twenty-three supermarket units of the Standard Grocery Company of Indianapolis, a division of National Tea, E. T. Ramsey, Construction Supervisor of the Indianapolis Division of Standard, pushed forward his program of eliminating the use of water from refrigeration systems. The latest step is the installation of additional Unicons and Kramer Thermobanks on 110 hp of refrigeration at Standard's Maryland Street Warehouse frozen food storage and dispatching facilities.

Construction Supervisor Ramsey said that Thermobank and Unicon units, manufactured by Kramer Trenton Company of Trenton, New Jersey, were selected for this expanded warehouse installation to eliminate all use of water. He added that many previous difficulties resulting from plugged water cooled condenser tubes and earlier problems with water defrost unit coolers dictated the selection of these units.

In designing the installation for four storage rooms at Standard's Indianapolis warehouse, Ramsey specified the Kramer Unicon with the Kramer Winterstat for year 'round head pressure control.

The storage rooms, one 123 by 35 ft, one 60 by 35 ft and one 80 by 22 ft were designed for storage at minus 5 to minus 10 F, while the fourth room, 35 by 25 ft is held at 28 F for make up of deliveries to Standard supermarkets. Equipment for this make up room was designed to provide rapid refrigeration down to minus 10 F when additional storage space is required.

Two of the storage rooms are insulated with 8 inch cork, and two are insulated with 8 inches of Styrofoam. Six electric conveyor loaders are used to handle frozen food boxes in quantity. Ceiling-mounted Kramer Thermobank evaporators were specified to provide maximum storage space under the unit coolers. Ramsey, who directed the installation, said the combination of the Kramer Thermobanks, automatic hot-gas defrost systems, with the Unicon condensers blended into an overall system that virtually eliminated maintenance problems, in addition to complete elimination of the use of water with its maintenance costs.

The Unicons serve four compressors with a total of 110 hp. One compressor is 50 hp and one 30 hp, one 20 hp and one 10 hp. One No. 33P, one No. 25, one No. 22 and one No. 13 Thermobank combinations, represented the deforst ceiling suspended system of the installation, while the Unicon condensers comprised one BD 4000, one BD-3000 and two BD-1500 units, mounted outside on the roof and all equipped with Kramer Winterstats for year 'round operation.

## NARW Pays Tribute to Meat Institute

THE NATIONAL Association of Refrigerated Warehouses paid special tribute to the American Meat Institute for "outstanding contribution to the diet and health of America and Americans" at the AMI Golden Anniversary convention held the week of October 1 in Chicago.

William E. Ready, treasurer of the NARW, representing the public refrigerated warehouse industry, presented an engraved plaque to John F. Krey, vice chairman of the Institute's board of directors. Said Mr. Ready, who is also vice president and treasurer of the Indiana Terminal and Refrigerating Company, 240 South Pennsylvania Street, Indianapolis, Indiana:

"Through your constant research, improvement of industry products, and promotion of the economic development of the meat industry you have not only met the needs of an expanding population for meat products, but have helped make possible an increasing per capita consumption of this vital, health-giving product.

"Over the past 20 years the per capita consumption of meat has increased by 25 pounds and this has been accomplished in the face of a population increase of 34 million. To meet this challenge your industry is today producing 10 billion more pounds of meat every year than 20 years ago.

"Last year alone you produced nearly 27 billion pounds of meat products.

"Your contributions to the health of our people is a vital one because meat is a mainstay of the American diet and a rich source of protein, B vitamins and iron.

"These are outstanding accomplishments."

## Frost Formation On Refrigeration Coils

A REPORT from a study of frost formation on refrigeration coils (Univ. of Ill., W. F. Stoecker and O. W. Clausen) dated August 1956, contained data on tests with close fin spacing (9 per inch). Now a report has been submitted on wider spacing (4 per inch). The general conclusion is that a coil of wide fin spacing, as compared with one with close fins and equal overall dimensions, tends to operate less efficiently at low frost conditions but as frost builds up, the trend reverses. This is due to excessive drop in air flow as frost builds up in the close-finned coil.—TRRF Bulletin.

# Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS


## Operation And Maintenance of Rotary Booster Compressors in the – Prevention of

# REFRIGERATION PLANT FAILURES


RICHARD P. GODFREY

Assistant Plant Manager
J. H. Dulany & Son
Exmore, Virginia


### Vessel and Piping Hints for Booster System Protection.

1 — Adequate Suction Trap for Extreme Operating (Maximum) Conditions.

2 — Provision for Removing Excess Liquid from Suction Traps.

3 — Elimination of Liquid Pockets from Suction Line.

4 — Provision of Oil Drains on Suction Trap and Intercooler.

5 — Positive Anti-Syphoning Connection or Device to Prevent High to Low Side Back Flow Through Booster When Inoperative.

6 — Trapping of Gas Inlet to Horizontal Intercooler for Preventing Gravity Flow of Liquid from Vessel.

ROTARY booster compressors, among the newest development in industrial refrigeration, are already in widespread use throughout the food freezing, storage and ice cream industries. The plant of Eastern Storage Corp., is typical of this change, having one big rotary in freezer service and two smaller ones connected to the storage rooms. As a result, many operating engineers who grew up with single-stage reciprocating machinery are now in charge of multi-stage refrigeration plants using rotary boosters. This has led to questions on the proper operation and maintenance of this new member of the engine room family.

Extremely compact construction of the rotary is shown in Fig. 1, which is a photograph of a machine having the capacity of the old style 15 x 10 in. two-cylinder VSA booster. Simple construction and minimum number of moving parts are shown in the cross sectional views of Fig. 2. A steel rotor running in two roller bearings is eccentrically mounted in the cylinder. Plastic vanes slide in the rotor slots to maintain contact with the cylinder wall. Gas enters the space between blades on the suction side and is compressed as the blades move from top center toward the discharge port. This arrangement eliminates suction and discharge valves, crankshaft, connecting rods and pistons. The resulting simple machine has a minimum of parts requiring maintenance.

### Design of Multi-stage Systems

The preventive maintenance program for any compound refrigeration system starts with design of the

Author of this article on Rotary Booster Maintenance, R. P. Godfrey, has a dual-type position. He is Chief Engineer of Eastern Storage Corp., as well as Assistant Plant Manager at J. H. Dulany & Son, Exmore, Virginia. Eastern Storage is a separate corporation which furnishes refrigeration to the Dulany food freezing plant.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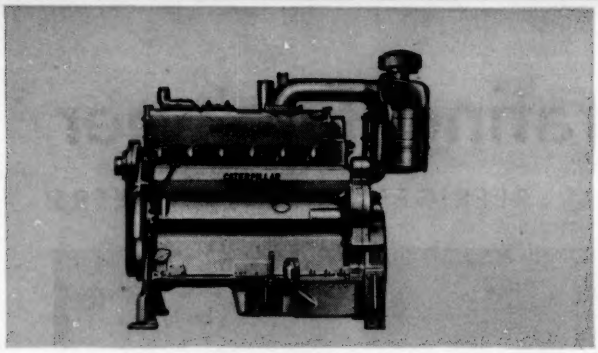
Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".



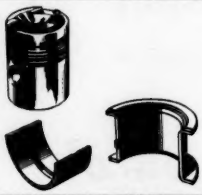
# A QUARTER CENTURY OF

**A CATERPILLAR FIRST**
—the "Hi-Electro" hardened cylinder liner

**A CATERPILLAR FIRST**
—the chemically conditioned cylinder liner

**A CATERPILLAR FIRST**
—the stainless-steel piston protector

**A CATERPILLAR FIRST**
—the steel-backed aluminum bearing



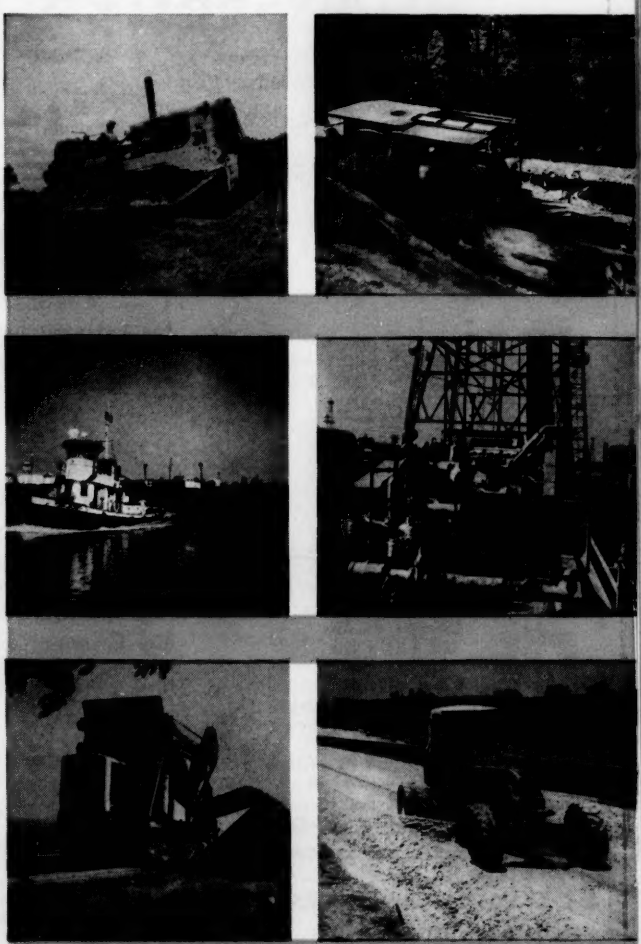
A quarter of a century ago, Caterpillar created mobile diesel power. For the first time, the power of the diesel engine was unleashed from its bulky foundations and put to work in the field—compact, economical. Here was diesel power of simple design, with no need for experts to operate and maintain. Here was diesel power with the lugging ability to knuckle down to the tough jobs.

The introduction of mobile diesel power was a tremendous advance in many fields. It provided efficient diesel power for tractors, motor graders, earthmoving equipment . . . for the work boat, the gin, the locomotive, the oil rig, the municipal plant . . . for *any* application in which steady, low-cost power is crucial. And everywhere, CAT* Diesel Engines proved themselves durable and dependable. They established Caterpillar as the leader in diesel engineering.

Today, hundreds of thousands of modern heavy-duty Cat Diesels are on the job in every corner of the world. And still the research continues. Study and experiment go ahead constantly in Caterpillar laboratories. Special testing machines help point the way toward new advances. Manufacturing techniques improve, too, in the world's largest diesel engine factory—where the quality of workmanship is the standard for the industry.

A modern world must have modern power—more and more of it. It is coming, in ever increasing quantity, from the production lines of Caterpillar, the leader.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



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**DIESEL POWER FOR PROGRESS**

# DIESEL LEADERSHIP

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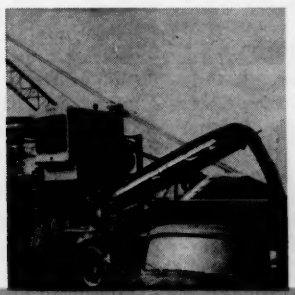
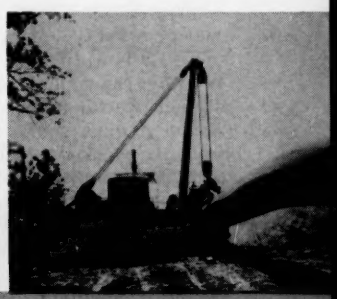
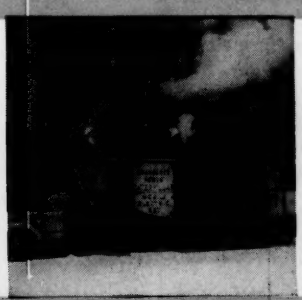
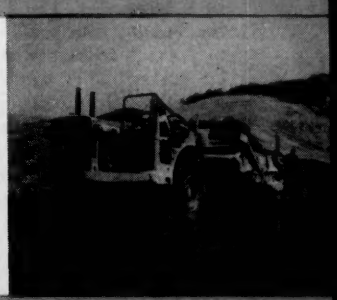







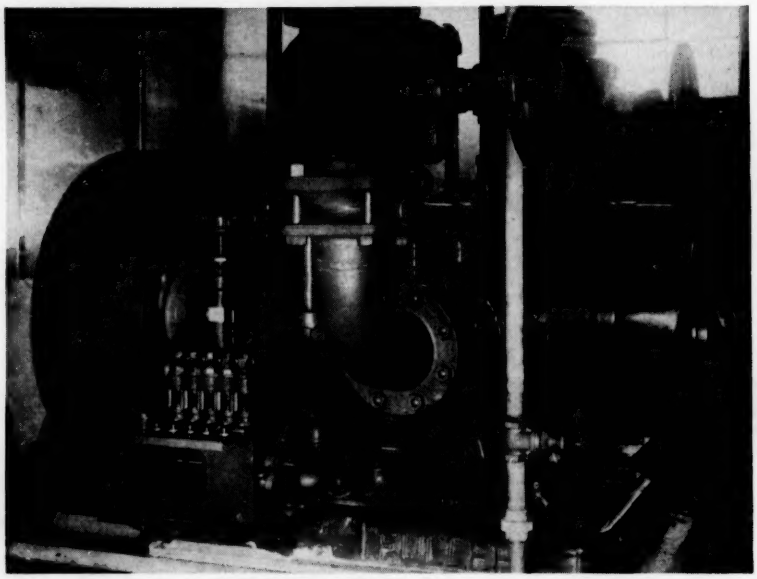


*Fig. 1 — Advantages in compactness of the rotary booster are readily apparent. However initial savings of this may be lost in failure to provide adequate clearance for drawing blades and rotor for annual and bi-annual inspections respectively. Maintenance time is often lost and costs increased by initial system layout which fails to consider service or overhaul problems.*

installation. A few simple precautions taken at that time will go far to assure successful operation of the rotary, or other type booster which may be installed.

Fig. 3 is a diagram of the typical two-stage ammonia system showing suction line trap, booster, intercooler and high-stage compressor. Starting from the evaporator side of the system, it is normal practice to install a trap in the suction line of the booster compressor. This must be large enough to prevent liquid carry-over to the compressor under any operating conditions. In small plants the liquid ammonia accumulation can be boiled out of this trap by a warm liquid coil. In larger plants, economy of operation will justify the cost of a liquid ammonia pump or other transfer means to put this liquid back into the high pressure receiver for re-use.

Suction piping to the booster compressor should come off the side or top of the header, not the bottom. This will eliminate the possibility that liquid ammonia or oil traveling in the header will enter the compressor in a large slug. The by-pass around the booster also should be arranged to prevent accumulation of liquid or oil during either single or two-stage operation. In other words, there can be no piping traps in the suction line.

The intercooler, or combination gas and liquid cooler, performs its cooling job, and also acts as a very efficient oil separator. For this reason, it should be designed and installed to permit easy oil drainage. Since the gas inlet pipe is below the liquid level in the intercooler, any gas leak from high to low side during shutdown may force liquid from the intercooler back into the booster. This back flow is prevented by installing as an anti-syphoning connection, a small check valve between the inlet pipe and the shell, with the check permitting gas flow out of the intercooler. Also, the gas inlet of a horizontal intercooler must be trapped to prevent gravity flow of liquid out of the intercooler.

### Provide Adequate Clearance For Machine Overhaul

An advantage with rotary compressors is that they may be installed in any location, either on the ground or any upper floor. Light weight and freedom from vibration make the heavy foundations required for some reciprocating compressors unnecessary. Very low overhead clearance is required due to the compact design, *but clearance must be provided at the back end of the compressor for removal of blades and rotor.* If direct connected, provision must also be made to move the motor to service the front end of the machine. If provisions are not available for lifting motors off anchor bolts, a steel base plate should be provided, with the motor secured to this base plate by tap bolts. This base plate should be large enough to permit the motor to be swung out of the way for compressor service work.

Rotary compressors start completely unloaded. At approximately 1/3 speed the blades begin to pump, after which full torque is required to pull the machine up to speed. Thus, normal starting torque induction or general purpose synchronous motors are best suited to drive rotary boosters. If an auto-transformer starter is used, the 80 percent tap must be employed to provide sufficient pull-in torque.

As received from the factory, the rotary compressor is generously lubricated with a water repellant oil. This permits short time storage in a dry place prior to running. However, if long storage is anticipated, or if the storage is damp, the blades must be removed and stored in a dry place. The factory lubricant need not be washed out prior to operation.

### Installation Precautions

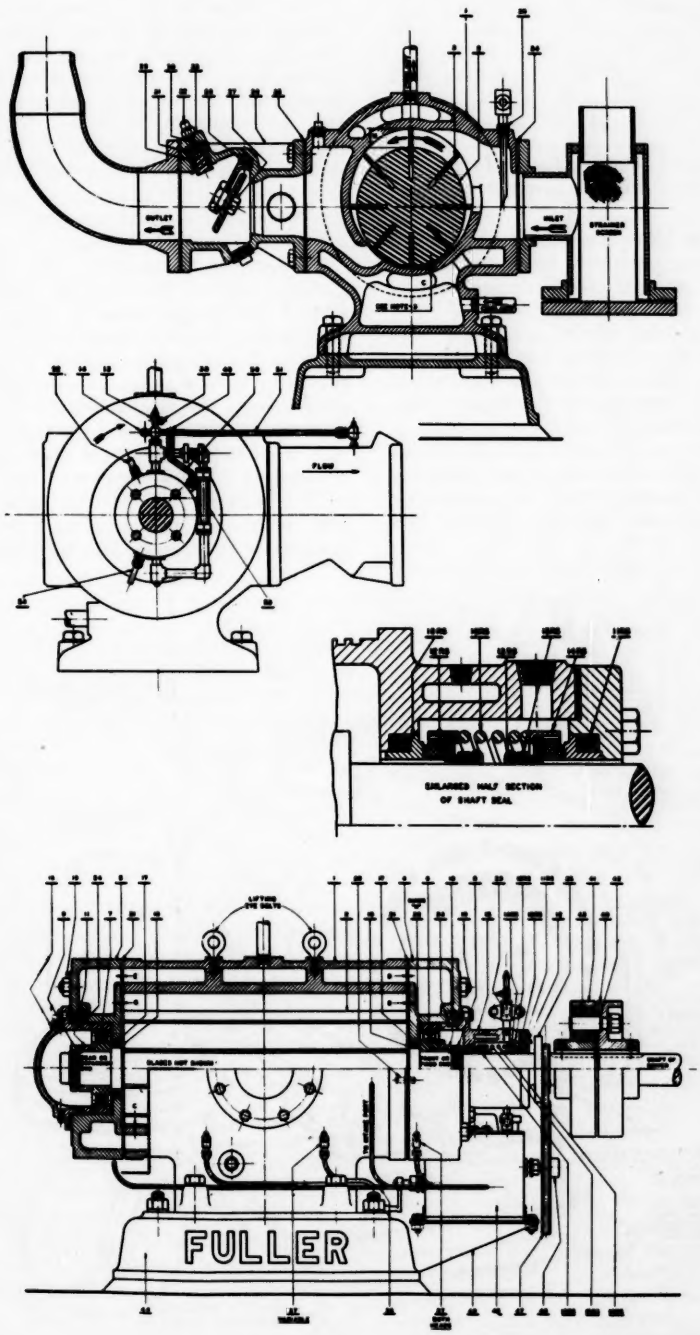
The rotary compressor may be leveled on its foundations, using the suction and discharge flanges and shaft as reference surfaces. If compressor and motor are mounted on a combination base, this should be grouted and bolted down securely before the final alignment of motor and compressor are checked. Distortion during shipment or installation may change factory alignment. If desired, the compressor and motor may be doweled to the base following this final check.

An adequate supply of cooling water at 20 lbs. pressure must be available. Preferably this should be city or well water, rather than cooling tower water. Where water is scarce, makeup to the cooling tower or evaporative condenser may be used for jacket cooling. Water from the jacket oil cooler should flow through a sight fitting for easy inspection.

FES-Fuller boosters are furnished with an oil-cooled jacket as a safeguard against freezing of the cylinder during prolonged low temperature operation or shutdown. The compressor is supplied with a double pipe, counterflow oil cooler in which the oil flows through the annular space and the water through the inside cooling pipe. The oil pump takes its suction from a small expansion tank mounted overhead to provide approximately 5 ft. head, and delivers warm oil to the cooler.

From the cooler, oil flows to the cylinder jacket, and, through a separate circuit, to the seal jacket. A valve should be provided at the low point of the oil piping to facilitate jacket drainage prior to cylinder inspection. Transformer oil or lightest grade mechanism oil is used in the jackets for good heat transfer. Lubricating oil is too heavy for this service.

Arrangement and typical piping of the capacity reducer furnished on many FES-Fuller rotaries is shown in Fig. 4. Discharge gas flows through a control valve into the expander pocket located below the normal suction port. Here it gives up its heat by doing work on the compressor blades. This prevents overheating which results from by-passing hot gas into the suction line and also reduces power consumption during reduced capacity operation. During full capacity operation, part of the suction gas enters the expander pocket through a separate connection from the suction strainer. All this piping is complete as received from the factory. At installation, it is necessary only to wire the capacity re-




## PARTS LIST

| PART NO. | DESCRIPTION OF PART |
|---|---|
| 1 | CYLINDER |
| 2 | ROTOR |
| 3 | BLADES |
| 4 | FRONT HEAD |
| 5 | REAR HEAD |
| 6 | FRONT BEARING FIXED END |
| 7 | REAR BEARING EXPANSION END |
| 8 | FRONT LOCKNUT & WASHER |
| 9 | REAR LOCKNUT & WASHER NOTE-NUTS ARE RIGHT AND LEFT HAND THREAD TO TIGHTEN AGAINST ROTATION |
| 10 | FRONT SPACER |
| 11 | REAR SPACER |
| 12 | SEAL COVER |
| 13 | SEAL RESERVOIR FILLER VALVE |
| 14 | BLEED VALVE |
| 15 | FRONT RETAINER |
| 16 | REAR RETAINER |
| 17 | HUB SEAL RING |
| 18 | SEAL RING RETAINER |
| 19 | STUDS & NUTS |
| 20 | DOWEL PINS FRONT & REAR |
| 21 | HEAD GASKETS FRONT & REAR |
| 22 | FRONT BEARING SHIMS |
| 23 | SEAL RESERVOIR SIGHT TUBE CONN. |
| 24 | O RING |
| 25 | LUBRICATOR & OIL PUMP DRIVE PULLEYS |
| 26 | NON-RETURN VALVE BODY |
| 27 | HINGE-DISC ASSY. INCL. BOLT & NUT |
| 28 | HINGE PIN & WASHERS |
| 29 | SPRING (FURNISHED ONLY ON MODEL NO'S. 175, 200, 250, & 300 COMPRESSORS) |
| 30 | LOCK SCREW (FURNISHED ONLY ON MODEL NO'S. 175, 200, 250, & 300 COMPRESSORS) |
| 31 | WASHER (FURNISHED ONLY ON MODEL NO'S. 175, 200, 250, & 300 COMPRESSORS) |
| 32 | CAP NUT (FURNISHED ONLY ON MODEL NO'S. 175, 200, 250, & 300 COMPRESSORS) |
| 33 | LEAD WIRE GASKET (FURNISHED ONLY ON MODEL NO'S. 175, 200, 250, & 300 COMPRESSORS) |
| 34 | INLET FLANGE GASKET |
| 35 | OUTLET FLANGE GASKET |
| 36 | OIL TUBING |
| 37 | ANGLE OIL CHECK |
| 38 | SEAL RESERVOIR FILLER CAP |
| 39 | INTAKE OIL QUILL |
| 40 | COUPLING-DRIVER HALF |
| 41 | COUPLING-ROTOR HALF |
| 42 | COUPLING PINS |
| 43 | BRONZE BEARING & RUBBER BUSHING |
| 44 | BASE |
| 45 | LUBRICATOR |
| 46 | PULLEY |
| 47 | BELT |
| 48 | SUPPORT |
| 49 | CHECK VALVE |
| 50 | PRESSURE TUBING ASS'Y. S'R'G. RET. TO SEAL RESERVOIR |
| 51 | PRESSURE TUBING ASS'Y. N.R.V. TO RESERVOIR |
| 52 | SEAL JACKET DISCHARGE TUBING ASS'Y. |
| 53 | SEAL RESERVOIR SIGHT TUBE |
| 54 | SEAL JACKET INLET TUBING |
| 10RS | SEAL SEAT - FRONT & REAR |
| 11RS | SEAL GASKET FRONT & REAR |
| 12RS | SEAL FACE FRONT & REAR |
| 13RS | FRICTION RING FRONT & REAR |
| 14RS | RETAINING SHELL FRONT & REAR |
| 15RS | FRICTION RING BAND FRONT & REAR |
| 16RS | SPRING |

*Fig. 2 — Four sectional views of the rotary booster showing parts in detail. Functions of essential elements are described in the text, plus detailed steps for periodic inspections, overhaul and reassembly.*

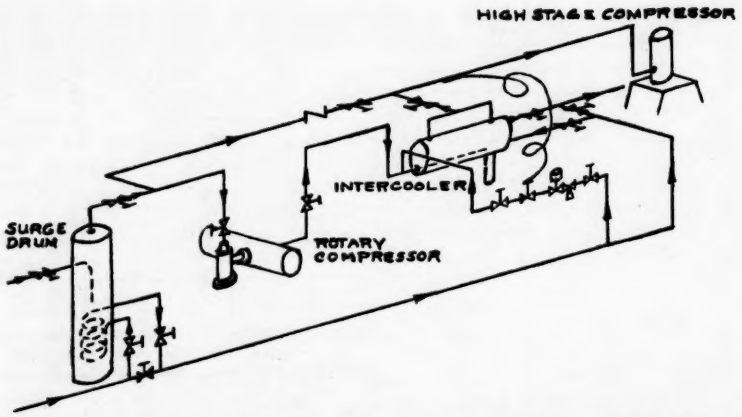



*Fig. 3 — Portion of a typical two 1-stage system showing proper location of suction trap, booster, intercooler and high pressure compressor.*

ducer control valve to a suction pressure switch or room thermostat.

### Testing Procedure

During pressure testing of the piping system, low side test pressure may be applied to the rotary compressor and its piping. In doing so, however, it is wise to apply this pressure slowly to allow a gradual build-up throughout the booster. This will prevent any possible damage to the shaft seal or other parts of the machine. *If the suction valve is opened suddenly,* allowing a very rapid increase in cylinder pressure, the small bleed valves in the seal equalizing system will not permit the corresponding rapid increase of pressure in the seal chamber, with the result that *the inner seal may be forced off its seat.* This difficulty does not become immediately obvious to the erection or operating engineer, and is discovered only if the charge of lubricating oil in the seal chamber is lost.

### Lubrication Adjustments

When ready to start, the force feed lubricator should be filled with a good grade of ammonia compressor oil having a viscosity of 300 SSU at 100 F. The use of lighter oils will not provide proper lubrication of either the blades or the bearings of this type compressor. Prior to starting, remove or disconnect all lube oil tubing at the small check valves mounted on the compressor body at the various points of lubrication. By hand, crank the lubricator until a full stream of oil with no air bubbles flows from each tube. This is an important procedure, because *air in the lube oil piping* not only prevents proper flow of oil to the lubrication point, but *may also lead to unsatisfactory operation of the lubricator.*

The lubricator should be adjusted for approximately twice the normal drop rate per minute during the first two weeks of compressor operation. Older compressors are fitted with lubricators having either glycerine, or a mixture of glycerine and water in the sight glasses. For these, a relatively low drop rate is recommended. Newer compressors are furnished *with Flurochemical* in the lubricator sight glasses. Drops of oil flowing through this solution are only 1/3 as large as those found in the sight glasses filled with glycerine, or glycerine and water. For this reason, *the number of drops per minute is multiplied by three.*

### Starting-Up The Plant

When starting the multi-stage plant for the first time, it is common practice to operate the high-stage compressor alone until it has pulled down to the normally anticipated intermediate pressure, or lower. Following that, the booster may be placed on the line. Start the booster compressor with the discharge valve open and the suction valve closed. With the booster running at full speed, the suction valve may be cracked and slowly opened, taking care not to load the compressor, beyond its normally anticipated discharge pressure.

As soon as the suction valve is partially opened, the by-pass valve around the booster may be closed. *The rotary booster should not be operated for any great length of time with the suction valve closed, and should never be operated with the discharge valve closed.* Operation with a closed suction will lead to overheating of the compressor and serious damage. High and low pressure cutouts will help to protect the machine from damage due to high

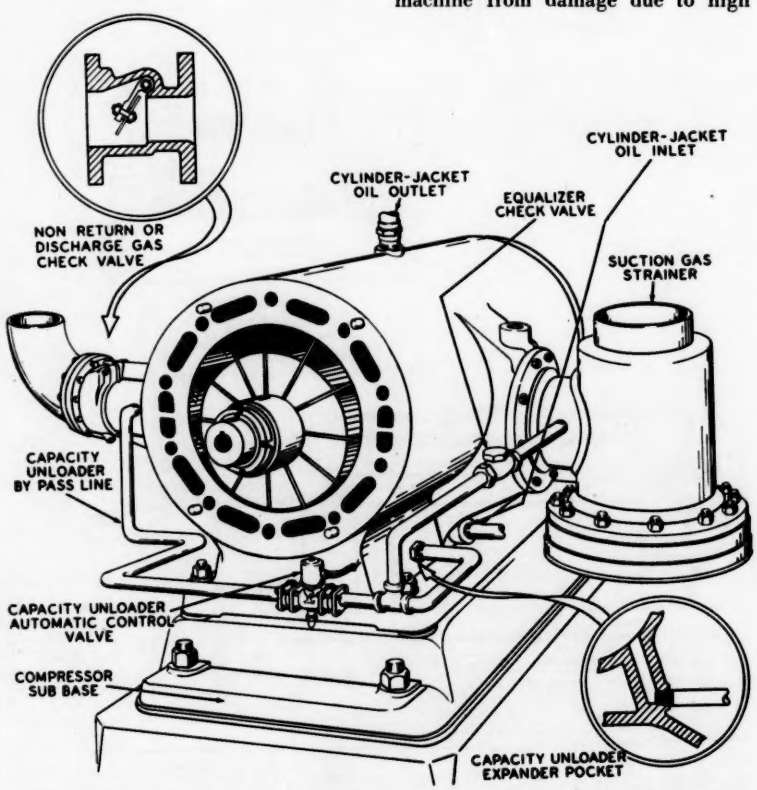

CYLINDER-JACKET OIL INLET
CYLINDER-JACKET OIL OUTLET
EQUALIZER CHECK VALVE
NON RETURN OR DISCHARGE GAS CHECK VALVE
SUCTION GAS STRAINER
CAPACITY UNLOADER BY PASS LINE
CAPACITY UNLOADER AUTOMATIC CONTROL VALVE
COMPRESSOR SUB BASE
CAPACITY UNLOADER EXPANDER POCKET

*Fig. 4 — Capacity control in the rotary unit is by means of the simple piping, unloader, and check valve shown here. See text for operational description.*

discharge or low suction pressure.

During the initial operation, check for any signs of vibration, unusual heating, or unexplained noises. The discharge side of the rotary compressor and the cylinder heads will be warmed by discharge gas. Several warm spots will be observed along the discharge side where solid plugs of metal extend from the inner cylinder through the jacket space to the outer shell. These are normal and do not indicate mechanical difficulty.

Discharge gas temperature should be limited to the maximum temperature stamped on the compressor nameplate. This should be measured by an accurate thermometer placed in the thermometer well in the discharge flange of the compressor. A thermometer located further downstream in the discharge piping will indicate a much lower temperature than that measured at the point described. If this temperature is excessive, check the evaporator for light load, or the suction line for high superheat. High suction superheats at normal loads must be corrected by insulating the suction lines or, if necessary, adding liquid injection.

### New Compressor — Old Plant

If the booster has been started in an existing plant previously operated single stage, it will be necessary to check carefully during initial operation to be certain that there is not excessive carryover of liquid and oil from the evaporators. Installation of a new booster automatically increases gas velocity in the evaporator with the result that liquid and scale will be carried into the system unless adequate precautions are taken.

A trap in the suction line will normally catch all this material. If provided, it permits removal of oil and dirt at this point and either evaporation or transfer of liquid to another part of the system. Lacking this suction trap, the booster should not be operated with wide open suction valve until such time as it is known that the evaporator has its normal quantity of liquid and that it is free of oil. In fact, it is a wise precaution to thoroughly drain all oil from the evaporator prior to starting a low temperature operation. The suction strainer of the booster should be cleaned several times during initial operation in an old system. In new systems, the suction strainer may be cleaned once; thereafter, subject only to a yearly inspection.

During the first day or two of booster operation, a very slight drip of lubricating oil may be observed at the shaft seal. During this time the seal faces "run in" to form a tight seal. During initial operation, check to be certain that the proper drop rate is being maintained in each pumping unit of the force feed lubricator.

Also check periodically the compressor and motor bearings to assure that there is no overload due to misalignment or excessive belt tightness. Belt driven compressors are furnished with special high capacity belts which require tightening several times during the first two days of operation. Belts should be drawn tight so that when running there is approximately a $\frac{3}{4}$-in maximum bow on the loose side of the belt. Following these initial takeups, further tightening of the belts will probably not be required. The belts driving the force feed lubricator and jacket oil pump should be kept tight to provide full speed operation of these auxiliaries.

### Normal Operating Routines

If the rotary booster is in continuous, 24-hour operation, the only watch maintenance required is periodic filling of the force feed lubricator, observation that all lubricator pumping units are functioning properly, inspection of oil level in the seal chamber, maintenance of a steady supply of jacket cooling water, and observation of normal temperature levels in compressor and motor.

In those plants requiring daily shutdown and startup of booster equipment, the procedure is to turn on the jacket cooling water, open the discharge valve, start the compressor and then gradually open the suction valve. If prior to starting, frost or condensation is found on the cylinder, the discharge valve should be opened and the cylinder thoroughly pumped out. Some heat may be applied to the compressor to speed up the pump out. Following this, turn the machine over by hand, and if free, start in the normal manner.

The rotary booster may be secured for short shutdown by following the sequence of closing the suction valve tight, stopping the unit, then closing the discharge valve. If the booster is operating on "wet" suction gas at the time of shutdown, allow it to run for several minutes with closed suction to warm up the cylinder and drive out all liquid ammonia. Batch freezing or similar plants operating on a "pulldown" load should guard against continued operation at excessively light load when the end of the freezing cycle is reached. Boosters may be taken off the line manually, or by means of thermostats or suction pressure switches. Capacity reduction, a relatively new feature available on the FES-Fuller, will automatically prevent excessive pull-down with accompanying overheating of compression equipment.

### Seasonal Shutdowns

Seasonal shutdowns of freezing equipment require only thorough pump down of low side and compression equipment, closing of all valves, and storage of the plant charge in the high pressure receiver. *Failure to pump down thoroughly is dangerous, as it can lead to loss of charge.* Also, leakage of ammonia into the rotary booster will probably swell the blades and cause them to stick in the rotor slots. Prior to a prolonged shutdown, it is good practice to open up the force feed lubricator for about 15 minutes to double the normal rate of lubrication.

### Yearly Inspection

Each year the cylinder of the rotary booster should be opened for inspection. After draining the jacket, the rear cylinder head is removed and bearing, blades, and rotor surfaces inspected. Jacking studs permit withdrawing the head off the dowels. When pushed against the front head, blades should extend flush with the back end of the rotor. Blades will wear slightly in rubbing contact with the cylinder wall, but need not be replaced until they are $\frac{1}{4}$-inch shorter than the depth of the rotor slots.

Blades should move freely in the slots. If bowed or swelled, they may be removed, clamped to a straight piece of steel and heated to 300°F for several hours. If not back to original size and free to slide in the rotor slots after this operation, the blades may be sanded to size. Swelling does not destroy the life of the blades. Roughness or chipping of the blades may be smoothed with a file or sandpaper. Cracking of the edges indicates liquid pumping. Fraying or brittleness of the rubbing edge indicates insufficient lubrication or operation at excessive temperatures.

Some wear of the rear side of the blade will be found due to rubbing against the edge of the rotor slot. Uniform wear of blades may be obtained by reversing them in the slots at each inspection, thus exposing the opposite edge to rubbing against the cylinder wall and the opposite side to contact with the trailing edge of the rotor slot.

Following this inspection the compressor may be reassembled. If torn or frayed, the cylinder head gaskets should be replaced. Since these gaskets help to fix the expansion end

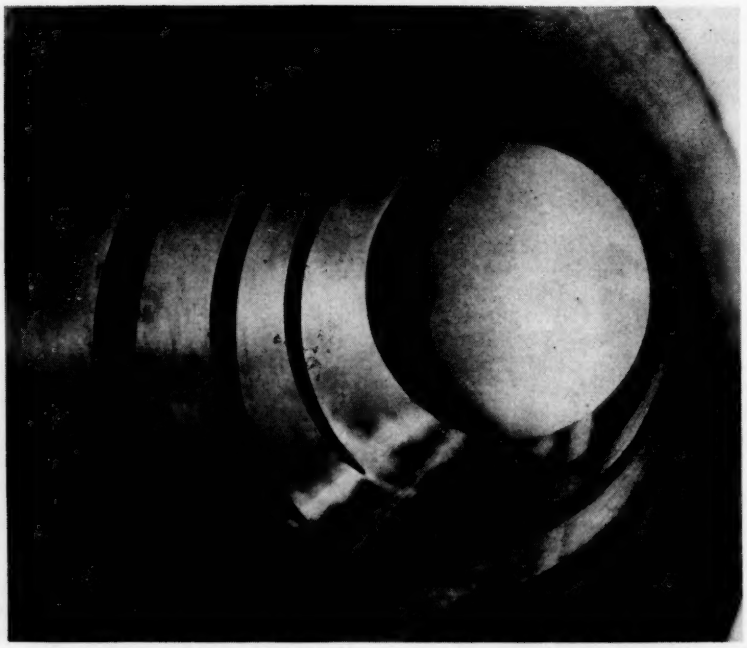


*Fig. 5 — Interior view of FES-Fuller rotary booster cylinder. Large boomerang shaped ports at left admits suction gas. Discharge, of course, is through the relatively smaller ports at lower right, gas being held between blades.*

clearance between the rotor and cylinder head, several gaskets of varying thickness may be found at this joint. The total thickness of old gaskets must be "miked" and the same thickness of new gasket installed, allowing for .002-in. compression of each new gasket. If this gasket replacement procedure is followed carefully, no other check of expansion end clearance is required.

Necessary gasket thickness at the rear (expansion) end head may be checked with the front (fixed) end of the compressor completely assembled. The rotor is pushed to the rear of the compressor to take up axial looseness of the fixed end bearing. Then with a straight edge across the rear cylinder head, a feeler gauge is used to measure clearance between the end of the rotor and the straight edge. *The required gasket thickness is the difference between the expansion end clearance stamped on the name plate and this clearance just measured, plus .002" compression allowance for each gasket used.*

At this time also, the lubricator and jacket cooling system should be cleaned. Lubricator pumping units should be dismantled, the glasses and ball check valves cleaned, and plungers checked for free operation through their full stroke. Water side of the oil cooler should be mechanically cleaned, or if excessive quantities of scale are present, chemical cleaning may be required. Solvent is circulated through the oil side of the cooler and jackets flushed using this same fluid.

### Complete Inspection

Every two years the booster should be dismantled completely for inspection of all moving parts. The rear end of the machine is dismantled by repeating "Yearly Inspection" procedures. Referring again to Fig. 1, the shaft end is dismantled by removing the flywheel or coupling half, then the dual pulley driving the lubricator and oil pump. Using emery cloth and a file, if necessary, dress off any rough spots on the shaft to prevent damage to seal parts during disassembly.

Oil is drained from the seal housing and then the seal cover plate removed, exposing the front seal parts for ready removal. Seal equalizer and jacket cooling tubing is disconnected. Flange bolts are removed from the seal housing and two of them inserted in the jacking holes provided to force out the seal housing. Sliding the seal housing along the shaft also moves the inner seal parts. Thus they may be moved forward until readily accessible and then removed before the housing is pulled all the way off the shaft.

The front end bearing is provided with thrust faces to lock the rotor into a fixed position in the front cylinder head. That bearing may be dismantled by removing the locknut and washer. This permits removal of the inner race collar, which then allows the front cylinder head to be removed and the rotor to slide out in either direction.

An interior view of the cylinder is shown in Fig. 5. Suction ports are large, discharge ports are small and well down on the side of the cylinder. In the FES-Fuller machine, an "undercut" will be observed at the bottom of the cylinder. This 3- or 4-inch band is machined to the radius of the rotor to provide the maximum seal between discharge and suction. Seeing it for the first time, *some engineers mistake this change in contour for a mechanical defect, rather than a part of the gas sealing system.*

Before cleaning, the oil film on the cylinder wall should be observed for thoroughness of lubrication. Any rough spots on cylinder wall or heads should be stoned smooth to prevent blade damage. Roughness along edges of the rotor slots should be filed off for this same reason. Inspect both bearings for signs of wear on races and rollers. Appearance of "skid" marks or other wear requires bearing replacement.

### Re-Assembly

To reassemble the compressor, the rotor and front cylinder gaskets are replaced. The rotor is extended slightly through the front end and cylinder head placed on the studs, but not bolted in place. Steel shims, if any, are replaced in the bottom of the bearing cavity and then the outer bearing race slipped in. Reassembled in order are the loose piece of the inner race, spacer ring, lock washer and locknut, with the locknut drawn securely into position. Following this, the seal housing is installed and bolted securely in position.

Never attempt to draw the flange of the seal housing tight against the head. This piece is built with a skirt which seats against the outer race to lock it in place; therefore, clearance is provided under the bolting flange. Gas tightness is obtained by using "O" rings in the skirt, not by flange gaskets.

By this procedure the rotor is locked into position in the front head and it is now possible to check the fixed end clearance between the rotor and head. This is checked with feeler gauges and the measurement must agree with the nameplate stamping. If necessary, this clearance may be increased by reducing the thickness of shims behind the bearing, or decreased by the opposite procedure. When the correct clearance has been established, the tabs of the bearing

lockwasher may be bent down into the slots provided and then the seal housing finally assembled in the head.

Thickness of head gaskets used on the front end are measured and noted, as these help determine the rear or expansion end clearance between rotor and head. The total thickness of gaskets removed from both heads must be reinstalled. These need not be replaced at the same end from which they were removed. It is only necessary to install the same combined thickness, distributing the gaskets between the two heads in any convenient manner.

Required thickness of the rear head gaskets may be checked as previously described in "Yearly Inspection." A further check can be made by installing the estimated gasket thickness at the rear head and then bolting both heads securely in place with several lead wires bent over the rear end of the rotor. These will be crushed to the expansion end clearance and may then be removed for checking with the recommended clearance stamped on the nameplate.

This part of the assembly procedure has been described in detail to illustrate the basic construction of the rotary booster. The remainder of the assembly may be carried out in accordance with the manufacturer's instructions.

Like any other piece of machinery, the rotary booster requires reasonable care and proper maintenance. However, compact construction and minimum number of moving parts make even a complete overhaul a minor task.

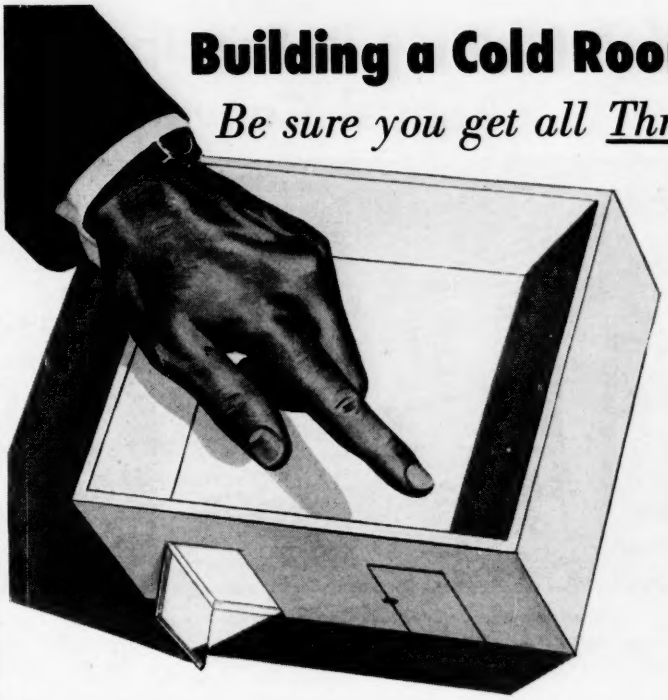
## Insecticide Protection For Fruits and Nuts

THE RECENT published pesticide tolerances, established by the US Food & Drug Administration did not include pesticide tolerance for certain post harvest fumigants that have been used for years. The interpretation of this failure to include seems to mean that it will be illegal to use any insecticide unless it is specifically indicated for a particular fruit or vegetable.

Producers and users of nuts and dried fruit may thus be forced to seek other methods of protection for their products from insect infestation. Since refrigeration is the safest and surest way to protect these products from insects, as well as to maintain product quality, it seems that a little sales effort by the refrigeration industry could well result in a considerable increase in the quality of these products.—TRRF Bulletin.


# Building a Cold Room?

*Be sure you get all Three*



**1. THE RIGHT MATERIAL—UNITED'S B. B. (block-baked) CORKBOARD**

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# *Maintenance* is Principal Theme of 47th Annual Convention NAPRE

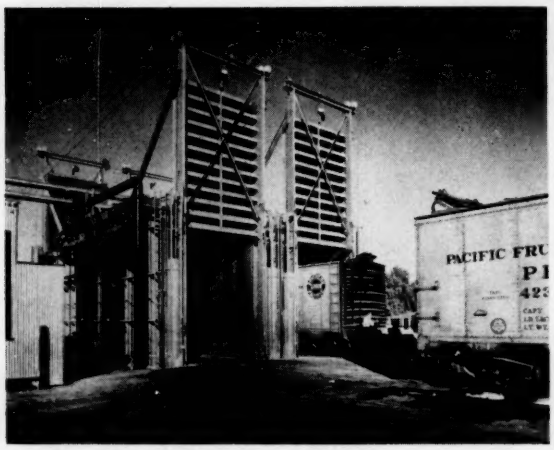



*Fig. 1 — Vacuum pre-cooling tunnels (tubes) which accommodate an entire railroad car, eliminating former forklift and conveyor operations at the cooling plant.*

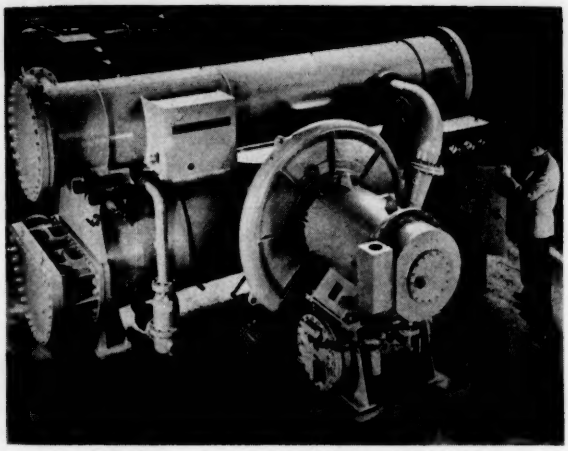


*Fig. 2 — Pictured here is a typical American Blower Corporation unit such as described by Robert Loebl in his paper on the Hermetic Centrifugal Compressor.*

MAINTENANCE was the predominant topic of the 47th convention, National Association Practical Refrigerating Engineers, held October 29 through November 2 at the Hotel Statler, Detroit. Opening papers for the Association's engineering and educational sessions were on this topic. Five speakers' topics were devoted to this subject in their entirety and several additional presentations laid considerable emphasis on servicing. A total of fourteen educational activities, which included both conference presentations and field trips, kept the members, delegates and guests more busily occupied in the Motor City than many delegates anticipated.

### Tour of Brewery

Although the actual safety, engineering and educational sessions did not get underway officially until Tuesday morning, October 30th, early arrivals were treated to a tour of the Stroh Brewery Co. These convention attendants were afforded an opportunity to review first hand the new equipment and refrigerating applications made at this famous Detroit brewery, as reported in INDUSTRIAL REFRIGERATION, October 1956, Page 13.

On Tuesday morning October 30, following an invocation by Rev. Dr. Robert Young, Pastor, Highland Park Presbyterian Church, Detroit, a welcome was given the delegates by Frank J. Drogosch, Chief Safety Engineer, City of Detroit. Mr. Drogosch incorporated in his remarks some comments on the safety program in the City of Detroit, the licensing of engineers and the requirements for engineering permits. The response to Detroit's welcome was handled by NAPRE Past President Alvis J. Clay, Memphis Chapter. Clay, who had held in the City of Memphis a position similar to Drogosch, reviewed briefly some of the previous NAPRE conventions held in Detroit, and pointed out as well that exchanges of information gained at NAPRE meetings had helped many other cities as well as Detroit in establishing fine safety programs.

### Safety & Maintenance Topics

Following the first business session, a safety session rounded out the Tuesday morning's activities. Lead-off paper was entitled "Manufacture & Inspection of Unfired Pressure Vessels". Tuesday afternoon was given over to the first papers on maintenance. Guy R. King, Vice Chairman, NAPRE Educational Committee, presented a review of contract service and maintenance programs giving advantages and short comings of such plans. King based a portion of his remarks on a survey he had conducted among NAPRE chapters during the summer months, on this topic.

He was followed on the program by NAPRE's Vice President (now President) Bert C. McKenna, Chief Engineer, Central Cold Storage Co., Chicago. McKenna's topic was on "Preventive Maintenance by Plant Personnel". Although his remarks pertained principally to cold storage operations, he emphasized that other industries utilizing refrigeration could initiate similar programs. McKenna quoted man-hours and costs, both for material and personnel, in carrying out his maintenance program.

National Officers presided over a Chapter Problem Clinic which followed the Tuesday afternoon engineering sessions. When the delegates apparently had their local chapter headaches prescribed for, the sessions reverted to an engineering Question Box, with the Officers and Educational Committee discussing problems presented from the floor. A take-off of the popular Question Box which appears in INDUSTRIAL REFRIGERATION, this session proved so interesting that it threatened to extend the afternoon sessions into the evening festivities.

### Special Railroading Exhibit

Highlight of the Wednesday sessions was the instruction and demonstration car of the Fruit Growers Express Company which was displayed at Union Station, Wednesday thru Friday. Instructor Carl Booker and several assistants received NAPRE delegates at their convenience on those three days, explaining the equipment installed therein and pointing out the service this equipment requires. A maintenance pro-

## Speakers and Headliners on Convention Program

*Prof. H. P. Hayes* *Guy R. King* *Bert C. McKenna* *Edw. P. Callanan*

*Principal speakers at the 47th Annual Convention, NAPRE: Dean Harold P. Hayes, Calif. State Polytechnic College; Guy R. King, Author & College Instructor, Santa Monica, Calif.; Bert C. McKenna, Central Cold Storage Co., Chicago, Ill., Edw. P. Callanan, Michigan Ice Mach. Co., Detroit.*

*Frank J. Dragosch* *Ruble A. Thomas* *T. E. Kurtz* *Dean Emerson Jr.* *G. D. Bausch* *Hal Jarvis*

*Frank J. Dragosch, Safety Engr., City of Detroit; Ruble A. Thomas, Atomic Power Development Associates, Inc., Detroit; T. E. Kurtz, Carrier Corp., Cleveland, Ohio, Dean Emerson, MMM Inc., Houston; G. D. Bansch, H. A. Phillips & Co., Chicago; Hal Jarvis, Refrigeration Engineering, Inc., Los Angeles.*

*Chester Anderson* *V. W. Snyder* *Gerald E. Hicke* *Robt. F. McKee* *Fred L. Young Jr.* *Robert Loebl*

*Thursday speakers at Engineering Sessions were: l. to r. Chester R. Anderson, Pres., Gay Engineering Co., Los Angeles; V. W. Snyder, Service Manager, Thermo-King Corp., Minneapolis; Gerald E. Hicke, Mgr., Transportation Div., Trane Co., LaCrosse; R. F. McKee, Mechanical Engineer, Pacific Fruit Express Co., San Francisco; Fred L. Young, Jr., Vice-President, Freezing Equipment Sales Co., York; Robert Loebl, Centrifugal Compressor Department, American Blower Corp., Detroit.*

gram was outlined for the engineers, who although they are not primarily responsible for such equipment, are often called upon to trouble shoot this rolling stock in an emergency.

The refrigerating plant in this car is a diesel electric conventional type with two refrigeration compressing units and a single evaporative coil arranged with two circuits. Portion of the system was made with transparent tubing in order that visitors could see the refrigerant as it functioned. Mounted inside the car were cut-a-way models of the compressor, coils, controls, etc. These visual aids helped immeasurably in explaining the functions of each component.

Back at the Convention Hall in the Statler, the Wednesday schedule got underway with a traditional breakfast session. Seven Industrial Members of NAPRE were cited and presented their new membership certificates. Membership trophies were also presented to the three leading chapters during 1956 in membership contests. Trophy awards were based not only on new members obtained, but the percentage increase in membership of the smaller chapters.

Representatives on hand to receive the industrial membership certificates in NAPRE at the special breakfast in their honor on Wednesday, October 31, were Dean Emerson and John C. Tyler, MMM, Inc., Houston; Wm. V. Richards and G. D. Bansch, H. A. Phillips & Co., Chicago; W. H. Krack, Sporlan Valve Co., St. Louis; Hal Jarvis, Refrigeration Engineering, Inc., Los Angeles; Angus M. Casberg, Edinburg Ice & Cold Storage Co., Texas; Frank D. King and John M. Muller, Railways Ice & Service Co., Kansas City; and Richard S. Saunders, Saunders & Co., Chicago.

### Nuclear Energy Talk Precedes Absorption System

Two engineering papers were presented Wednesday AM, the balance of the day being devoted to a tour of the GM Technical Center at Warren, Michigan. Although the first paper on the program of that date did not pertain directly to refrigeration, it was a topic of current interest to all engineers — "Nuclear

Energy Power for Industry". Ruble A. Thomas, Nuclear Engineer, Atomic Power Development Assoc. Inc., Detroit, was the speaker under the auspices of the Detroit Edison Co.

Practical engineers who are involved with the operation of central station air conditioning systems were given a brief versing on the principles of the water vapor absorption refrigeration plant by T. E. Kurtz. This speaker is with Machinery & Systems Division, Carrier Corporation, Cleveland. His topic also covered the service and maintenance of such units, with particular emphasis on the refinements added to this equipment in recent years. (His discussion might have been considered in the nature of a reply to Kelly Danahy, that fictional engineer who made his appearance in INDUSTRIAL REFRIGERATION in September and October this year; an opponent of vapor type absorption plant).

Transportation refrigeration held considerable interest for the NAPRE delegates this year. The majority of guests in attendance indicated an interest on the part of the operating personnel of railroads and refrigerator car firms in acquiring information on the new mechanical refrigerator units. NAPRE offered a forum on this topic moderated by its Educational Chairman Professor Harold P. Hayes, Dean of Engineering, California State Poly Tech College, San Luis Obispo, Calif.

Gerald E. Hicke, Transportation Division, Trane Co., LaCrosse, Wisconsin discussed the maintenance of mechanically refrigerated railroad car units, while V. W. Snyder, Service Manager, Thermo King Corp., Minneapolis handled the topic of "Servicing Truck Units". Following these two presentations a Question Box, limited to questions on refrigerated transportation, indicated that equipment of this nature is doing a good job, with a minimum of failures reported. However, there are very few engineers in the field who are familiar with this equipment, its servicing and maintenance, or trouble shooting when required.

Following the forum, Chester R. Anderson, President, Gay Engineering Corp., Los Angeles, presented a paper entitled "Vacuum Cooling the Field Loaded Refrigerated Car". As shown in Fig 1, Anderson's discussion dealt principally with the design and operation of vacuum and refrigeration equipment for cooling of entire cars. He was followed on the program by Robert F. McKee who presented a discussion on the "Application of Centrifugal Compressors to Industrial Ice Making".

It was a repeat performance for McKee, having been on the NAPRE program last year to describe the 400-ton reciprocating automatic ice plant which he helped design at Laramie, Wyoming. The plant which McKee described at the Detroit meeting was the new Ogden, Utah plant of Pacific Fruit Express Co., a 500-ton installation. It is believed that the application of centrifugal compressors in this instance is not only the first such application in modern times, but may also be the first application of Refrigerant-11 in the field of industrial ice making.

### Food Freezing & Storage Air Conditioning Finales

Concluding educational and engineering sessions of the NAPRE Convention presented Fred L. Young, Jr., Vice President, Freezing Equipment Sales, York, Pa. on "Package Food Freezing and Cold Storage Systems" and Robert Loebl, Project Engineer, American Blower Corporation, Detroit on the "Practical Application of Hermetic Centrifugal Refrigerating Machines". Young's talk dealt with four types of freezing installations found in current food freezing practices. As in other convention papers, considerable emphasis was placed on maintenance and service as well as operation.

Loebl's presentation described the design of the hermetic type centrifugal compressor and the advantages of this equipment. His discussion included operating steps to be followed by the engineer in charge of such installations, servicing techniques, and maintenance expected of that engineer.

Following this educational session, NAPRE held its annual election of officers. The following morning, after the annual meeting of its Board of Directors, Advisors and National Committees, a large number of the delegates occupied themselves with post-convention tours. Included among the tour sites were —

The Gelatin Products Corp.
The Fred Sanders Corp.
The Stroh Brewery Co.
City County Bldg.
Northland Center
Statler Hotel

### Social Activities

Social activities provided for the NAPRE attendants included the President's Reception on Monday evening, an informal party on Tuesday evening at which Chrysler Airtemp Construction Corp. of Dayton, Ohio was host, an exhibitors frolic and Halloween Party at the St. Clair Yacht Club at which the Chicago Chapter was host, and the annual Officers Reception and Banquet. NAPRE installs its Officers at its annual dinner meeting. This affair, as in the past, was followed with a dance.

Ladies accompanying members, delegates and guests to the 47th meeting attended the opening session and the evening socials. In addition to these activities they visited Greenfield Village, lunched at Clinton Inn and then toured the Ford Museum on Tuesday, October 30th. On Wednesday October 31st, they toured the Plymouth Motor Corp. Assembly Plant, followed by luncheon at Stockholm Inn. That afternoon was spent on a sight-seeing trip to Windsor, Ontario, Canada with travel to Canada via the International Bridge and return thru the tunnel between Windsor and Detroit. Although Thursday afternoon was left open to the ladies for their own personal desires, the morning was busily occupied with a visit to the Fred Sanders Corp., a bakery and confectionery which was featured in an article earlier this year in INDUSTRIAL REFRIGERATION. That visit was climaxed with a shopper's tour at the J. L. Hudson Co., Northland Center Department Store.

### Convention Committees

Local officers and committees who arranged the convention activities were Roy T. Burns, General Chairman; Chas. M. Heemstra, Chapter President; Leonard V. Bedard, Sgt.-at-Arms; L. L. Adams, Secretary; Howard A. McDonough, Treasurer; Wm. Appleton, Chairman, Lawrence Julian, Transportation; Chas. J. Purdie, Jr., Chairman, Eugene A. Lake, Reception; Leonard V. Bedard, Chairman, L. L. Adams, Frederick M. Bonjour, Registration; Norman F. Danaher, Chairman, Norman E. Garant, Melvin A. Larsen, Entertainment; Chas. M. Heemstra, Chairman, Roy T. Burns, Leo C. Gage, Howard A. McDonough, Wm. F. Eberlein, Peter Svalya, Accommodations-Hotel; Leo C. Gage, Chairman, Publicity; Walter Arndt, Chairman, William Jeffery, Exhibits; J. K. Rawsthorne, Chairman, Boyd Kitts, Educational; Norman E. Garant, Chairman, Howard A. McDonough, Program and Arrangements; Erskine L. Sheffer, Chairman, George B. Bright, Jr., Refreshments; Wm. G. Euth, Chairman, Roy T. Burns, Howard A. McDonough, L. L. Adams, Finance; Mrs. Roy T. Burns, Chairman, Mrs. William Appleton, Mrs. Norman E. Garant, Ladies Activities.

# From the President's Desk

## New Chief Executive Sets Long Term Goals — Membership and Chapters Expected To Double

TIME does not permit me to correspond personally with each member of NAPRE, so I am taking this way of thanking each of you for your confidence in electing me President of this Association. I am confident that all the officers and members will continue to give their support in keeping NAPRE the leader in its field. Let's start by turning to Page 6 in our 1956 NAPRE *OPERATING DATA BOOK*. Your National Officers have worked hard to set up this proposed Four Year Program.

Education heads the list, as it should. Please take advantage of it; let the Educational Committee know their efforts are worth while.

### Membership

Note our goal of 6000 members! Why, to listen to the native sons of Texas, who are well represented on the Board of Directors, the state of Texas should have that many alone. Not counting New Orleans, which always does so well and does not have to be prompted in the Membership department, let's each bring in one new member. Results—goal accomplished!

### Publications

With more members, the more varied our material will have to be in the various NAPRE publications. However, with variety will also come volume. Our space is limited in our official organ and in our annual Year Book. Therefore, we should improve the material for these publications and make use of monthly bulletins to chapters and members-at-large for purely NAPRE items of social or organizational interest.

### Industry Relations

The more education, the better the engineer. However, the organization alone cannot improve the educational program. For that reason, we have opened up our membership to an Industrial class. Industry, both manufacturing and operating firms, are now afforded an opportunity to participate in NAPRE's educational program. Our Industry Relations Committee has a big job cut out for it, bigger than ever before. Theirs is the task of liaison between our Educational Committee and our new Industrial Members.

### Program 1957 — 1960

**Education:**

A practical monthly article in INDUSTRIAL REFRIGERATION.

Direct mailing a quarterly educational piece.

Completion of the Instructor's Manual for *BASIC REFRIGERATION* (a condensed version for Members-at-Large).

Selected courses of study on air conditioning, electric motors and controls, pumps and plant auxiliaries, pneumatic and electric controls.

Certificates of Proficiency for each course offered.

**Membership:**

Goal of 6,000 members.

Chapter 30 more chapters.

**Publications:**

Improvement of Data Book contents, such as

(a) Condensed convention papers

(b) Reprints from publications not available to all members

(c) Selected charts, tables, graphs, etc., used for NAPRE courses.

Publication of Monthly Bulletins

(a) to the chapters

(b) to the Members-at-Large.

**Industry Relations:**

Industrial Membership promotion and participation in Educational program.

Participation in engineer apprentice standards and training.

Participation in national safety programs.

**Venemann Fund:**

First loan to a student in 1957.

Expansion of fund to $6,000 in loans by 1960.

**Finance:**

Continuous review of financial needs of the Association.

**Administration:**

Assignment of Directors for specific supervision and responsibility such as Education, Membership, Finance, etc.

Provide for an Assistant Secretary before 1958; a member trainee to succeed as the Association's salaried executive.

*Bert C. McKenna*

### Venemann Memorial Fund

I, for one, will never be satisfied until this fund can support scholarships without the *loan provision* that it now contains. Until our fund has grown, it must of necessity be a revolving one. In the future, however, we can build this fund so we can afford to make annual direct scholarship awards. NAPRE will have the satisfaction of having helped an individual who could not have otherwise afforded it, obtain technical training and education.

### Finance

All depends on the future financial program of the Association. For the first time in NAPRE history we will have a Financial Chairman who is a member of the Board of Directors. This closer cooperation between the Directors, the Treasurer, and National Office and the Industrial Members should result in much success and prosperity for our Association.

### Best Reports

Under leadership of the Association's Secretary, incentives are to be set up which will encourage better chapter reporting. More information and educational facts are to be contained in the chapter reports appearing in our official organ — less personal "chit-chat". The column will continue the practice of citing the report of the month; this month it's the report from the Seattle Chapter by John Grainger.

On behalf of myself and the National Officers, I wish to thank those members who participated in our recent Convention and established the four year program. I wish also to take this opportunity to express to all members and their families a very happy Thanksgiving.

Bert C McKenna

## More on Question No. 1124

### Hot Basement Location Reverses Condenser—D.E. Coil Functions

**QUESTION NO. 1124: We have a compressor and its associated condensing equipment located in the basement floor of our building in a pipe gallery. Since steam lines, hot water and other utility equipment is located in the immediate area, temperatures are often in excess of 90 F.**

**Direct expansion coils for the air conditioning system which this compressor serves are located on the 3rd floor of the building approximately 44 feet above the condensing plant. We always get rather wet gas back to our compressor and generally lose all the oil out of the compressor crankcase on start-up (See Figure 1 below):**

**The compressor itself is a 4-cylinder 4½" bore No. 7G6 Carrier. The refrigerant is "Freon-12". We operate at 35 pounds suction and 145 pounds head pressure. Liquid leaves the combined condenser receiver and rises to the third floor where it passes through an Acme 14-inch by 4-foot heat exchanger. It is supplied through Sporlan expansion valves with ⅜ inch ports to two American Blower Company coils. The Sporlan valves are thermo bulbs operated through an external pilot.**

**The direct expansion coils are 18 tube No. 86 type CH with the tube length of 4 ft. 6 inches. On the low side at the compressor a Hubbell back pressure valve is located. This is a temperature controlled, air piloted type of valve which we have by-passed at present. The compressor is equipped for 50 percent capacity reduction, also air controlled.**

**The operating department here would like to relocate the compressor and condenser on the 3rd floor, but meets with opposition from the engineering and building departments. It is the operating department's contention that our high condensing location and the long liquid lift allows considerable flashing to take place before the liquid ever reaches the coils. The large expansion valves also permit more liquid to enter the coils than is needed. During shut down the coils actually act as a condenser. We believe this is what results in the return of wet gas and slop-over to the compressor.**

**Further, the operating department contends that wet gas returning to the compressor is the cause of the oil boiling off with the refrigerant on start-up. What sort of controls would you recommend to prevent this slugging and oil wash-out?—E.W.A., St. Louis, Mo.**

NAPRE

# Question Box

**The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.**

*ANSWER* No. 2: I fail to see why the "hot basement location" of EWA's compression and condensing equipment should be the cause of his trouble. The high side of any refrigeration system is more often than not located in the hottest part of the plant or building. And thousands of successfully operating air conditioning systems have such equipment located in the basements of the buildings they serve.

Further, and more specifically, vapor at the expansion valve is hardly likely to be found in the same system and at the same time as liquid in the return vapor where the vapor returning from, and the liquid going to the evaporator pass through a heat exchanger. The vapor in the liquid should be condensed, since it is at a high pressure, and the liquid carryover should be evaporated, at least in part. That is one of the principal reason why a heat exchanger is placed across the two line — to increase the efficiency of the system.

#### Heat Exchanger Functions

The heat exchanger also serves as a small reservoir to trap off liquid from the returning vapor and hold it until it is evaporated by the hot liquid from the receiver. If liquid is present on the low pressure or vapor side of the exchanger, any flash vapor formed in the liquid line by decrease in pressure due to diminishing head should be recondensed. If it does not, there is likely oil-logging of the exchanger.

A point often overlooked is that the heat exchanger should also serve as a vapor reservoir to stabilize the flow of vapor to the compressor.

#### Believes Lack of Control To Be Major Problem

The location of the surge tank is not clear in the drawing. Nor is the reason why the back-pressure valve was installed apparent, since such a piece of equipment has as its main office the holding of a predetermined pressure in one evaporator while the compressor operates at a lower pressure on other evaporators. If sluggish in operation such a valve in EWA's system would permit the compressor to pump down a short length of vapor line to a high vacuum, also pumping down the crankcase, and causing the oil to foam and slug. This condition would be aggravated by moisture in the system.

While this system may have faults in design, the main trouble seems to arise from lack of control. This control — or lack of it — centers at the thermostatic expansion valves. Is the feeler bulb firm in the adapter and the adapter firm on the return pipe at the proper location? Is the needle corroded so much that it leaks? Are the push pins too long, so as to hold down the carrier and prevent the needle from seating? Does the packing around the push pins permit unrestricted pin movement? I once found a Sporlan valve, with power assembly on top, in which one of these pins had fallen out unnoticed by the operator, and the liquid was consequently pouring through the opening thence through the inside equalizer passage into the evaporator.

Incidentally, a thermostatically operated expansion valve that is too large may be better controlled and its capacity reduced by replacing the discharge nozzle with one having a smaller bore.—O.LeB., Butedale, BC, Canada.

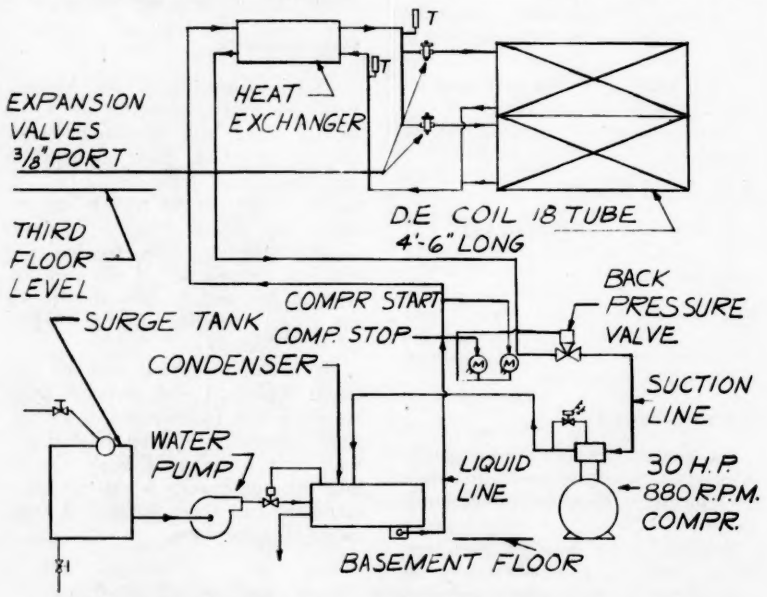



*Fig. 1—Section view of system described in question No. 1124.*

## More on Question No. 1126

### Relief Valve Corrosion

**QUESTION NO. 1126: During examination of the relief valves in our plant, all of which are piped to the exterior of the building, an amount of corrosion was found in the discharge piping and in the discharge opening of the valve itself. There is some speculation that the relief valves would be corroded shut. Has this been known to happen? How can we prevent corrosion of this nature? L.M.E., New York.**

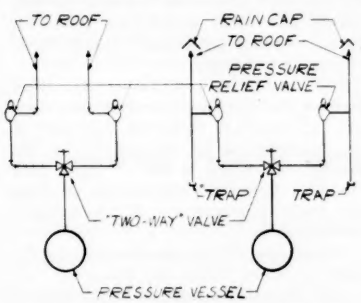
*ANSWER* No. 3: Supplementing J.M.M. and B. C. McK's answers, we have for many years recognized the fact that ammonia relief valves do corrode shut. The practice we have followed is to install a tee in the discharge line about 6 inches above the valve, with a union in the line just above the tee (See Fig. 2). We then fill the line with oil to the top of the ell and screw a plug into the outlet of the ell.

If at any time the valve is to be checked, the plug is taken out. If the valve has lifted most of the oil will be gone. Usually the valve will weep under normal operating pressure after it has once lifted. To check that possibility break the union and refill with oil. Bubbles will indicate weeping.

We also use standard weight galvanized pipe for outlet piping to cut down corrosion and use a tee with two turned down outlets at the upper end of the outlet line, as per sketch.

ASME specifications now call for needle and seat to be of corrosion resisting material; also full capacity outlet, two way valves and double safety valves for this service. In the interests of safety, $NH_3$ receivers should be so protected whenever it becomes necessary to empty the receiver.—H.N.R., Los Angeles.

(See also Question and Answer No. 1135, this issue. H. P. Hayes



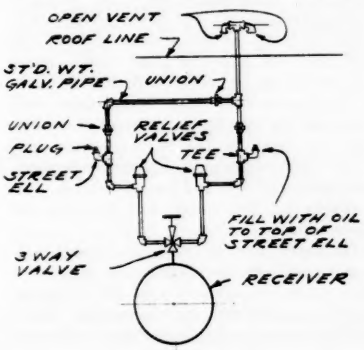




*Fig. 1 (left) JMM recommended the arrangements at right prevent corrosion. Fig. 2 (right) HNR suggests this arrangement, in improvement over Answer 1 and 2. (See also Question No. 1135, Pg. 42)*

## Will $NH_3$ Temperature Change If Container Volume Triples?

**QUESTION NO. 1134: Ammonia at 40 F is stored in a 5 cu ft container. If it is transferred through an orifice to a 15 cu ft container, what would be the final temperature of the ammonia?—R.L.R., Tampa, Fla.**

*ANSWER*: Let us assume that 200 lb. of liquid ammonia is involved.

A heat balance equation taking all variables into consideration could be written; however, an approximate step by step solution involving certain approximations will probably give a more clear picture of the process.

The change of volume of the liquid ammonia will be small so that we will consider this volume change to be negligible. We will also use the latent heat

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can't get to your insulation...
when it is erected with cold-applied ENAMELITE®

Here you see a "demon"-stration of what *can't* happen to rigid-type, low-temperature insulation when it's properly erected with ENAMELITE No. 330. Moisture-vapor penetration is effectively stopped by Enamelite's dense, adhesive bond.

Performance records on job after job over a 25 year period prove that Enamelite helps maintain the efficiency and life of the bonded insulation indefinitely.

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K A P

of evaporation at 40 F although the evaporation will occur most of the time below this temperature.

The additional volume, to be filled, in the large drum is approximately 10 cu. ft. The specific volume of ammonia vapor at 40 F is 3.97 cu. ft. per lb. The liquid ammonia to be evaporated will be 10 ÷ 3.97 or 2.54 lb. The latent heat of evaporation of ammonia at 40 F is 536 Btu per lb. The heat taken in during evaporation will be:

$$536 \times 2.54 = 1360 \text{ Btu}$$

The specific heat of liquid ammonia is 1.09. The change in temperature of the liquid ammonia will therefore be:

$$\Delta t = \frac{\text{Btu}}{\text{lb} \times c}$$

$$\Delta t = \frac{1360}{200 \times 1.08}$$

$$\Delta t = 6.3 \text{ F}$$

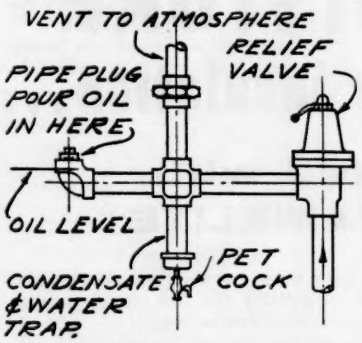
The final temperature of the ammonia will be

$$40 - 6.3^\circ = 33.7^\circ \text{ F.}$$

Of course, if a smaller weight of ammonia were involved the temperature change would be greater.—H. P. Hayes.

## Is Corrosion Prevention Idea Acceptable In Practice?

**QUESTION No. 1135: To prevent corrosion of $NH_3$ relief valves (similar to question No. 1126, September I.R., pages 37 and 38), why not fill them with oil above the seat as shown in sketch below? Water being heavier than oil, any water entering through the vent pipe will drop down into the pipe leg where it can be drained out.—K. K., Mil., Wis.**




*ANSWER*: Your trapping arrangement with oil above the seat of the relief valve will probably reduce corrosion but would hardly eliminate it entirely since lubricating oil is somewhat hygroscopic and absorbs moisture.—H. P. Hayes.

## Cooling Tower More Effective If $H_2O$ on, Above or Below DB

**QUESTION No. 1136: Does it make any difference in cooling tower performance whether the incoming water enters at a higher or lower temperature level than the dry bulb of the air? In other words, if the air is 95F DB and 70F WB, will the tower work as well with 100F water as with 90F entering water?—C. T. I., Kansas City, Mo.**

*ANSWER*: It is assumed that the water quantity is to be held constant in both instances.

The potential causing heat to be transferred from the water to the air stream is the mean difference in specific enthalpies between the saturated air film that is always present on the water droplets and that of the air stream. The wet-bulb temperature of the saturated air film on the water droplets is always substantially at the water temperature.

Since specific enthalpy is a function of the wet-bulb temperature rather than the dry-bulb temperature only the wet-bulb temperature of the air stream need be considered. Thus an air stream at 105° DB, 70° WB will have the same cooling effect as an air stream at 95° DB, 70° WB.

An increase of water temperature will increase the specific enthalpy of the saturated air film on the water droplets and hence will increase the potential between the saturated film and the air stream. The capacity of the tower will thus be increased.

However, this increase in capacity will not be sufficient to result in the same leaving water temperature with 100° entering water as with 90° entering water. There will be an appreciable increase in leaving water temperature. In order to compute this increase it would be necessary to know the water quantity, the air quantity, and the enthalpy transfer coefficient for the tower.—H. P. Hayes.

## Can $NH_3$ Be Used to Trace Refrigerant-12 Leaks?

**QUESTION No. 1137: What, if any, are the objections to adding from 3 to 5 percent by weight of ammonia to a Refrigerant-12 system to aid in detecting leaks?—D. B., Los Angeles**

*ANSWER*: Probably no damage would occur if the ammonia and the Refrigerant-12 were *absolutely* free from moisture and air. However, if a small amount of moisture is present in the system the Refrigerant-12 is acid forming, particularly if the system is operating at a high condensing temperature. Also the ammonia would dissolve in the water forming ammonium hydroxide. The acids would combine with the ammonium hydroxide forming ammonium chloride and ammonium fluoride. While the acids often formed in Refrigerant-12 systems can be removed with a dryer it would be very difficult to remove the ammonium chloride and ammonium fluoride both of which are corrosive substances.

### Reacts With Air Also

If there were any air in the system the result would be similar to that with water in the system since at high temperature the air will react with the oil, forming water as one of its decomposition products. I believe the Kinetic Chemical Company's advice should be followed: Keep the refrigerant as pure as possible.—H. P. Hayes.

## Wants Description and Use Of AC Motor Starter Component

**QUESTION No. 1138: What is a shading coil and why is it used?**

*ANSWER*: A shading coil is a closed circuit ring of a low resistance conductor set in the face of the magnetic holding coil core where the movable part, called the armature, strikes the stationary core.

In a single phase, alternating-current magnet without some modifying feature, the pull is proportioned at all times to the instantaneous value of the exciting current and reaches zero twice every cycle. The result is that the magnet starts to open every time the pull reaches zero. The mass of the moving part is usually large enough to prevent complete opening during this small interval of time, but there is enough movement to cause severe chattering and noise.

The shading coil overcomes this effect because the current induced in this shading coil produces a flux in that part of the magnetic circuit surrounded by the shading coil which is out of phase with the main flux. The combination of these two fluxes produces a pull which never reaches zero.

Maintenance: If the humming should become excessive, check the following:

(1) The sealing surfaces of the magnet may be corroded, thus keeping the magnet from sealing perfectly.

(2) The mechanical parts of the magnet surface may be so distorted that the moving armature cannot find a square seat. Check this by closing the contactor electrically after placing a sheet of tissue paper between the surfaces.

(3) The voltage may be low

(4) The shading coil may be broken

(5) Spring pressure may be high

—R. G., Los Angeles.

# New Questions

## Temperature Indicating By Radio Waves?

**QUESTION NO. 1139: I recently read in a news magazine that the Naval Research Laboratory detected radio signals from Mars and therefore concluded that the planet Mars has an average temperature of about 32 F. Is this a new means for measuring temperature? If so, why couldn't the principle be used in temperature measuring instruments?—F. W., New Orleans, La.**

## Excessive Ells and Fittings Reduce System Capacity?

**QUESTION NO. 1140: Is there any set of charts available for sweat fittings in the ⅝ to 2⅝ in. sizes that will show the pressure drop for Refrigerants -12 and -22 through short bend (standard radius) ells as compared to long sweep (long radius) ells, at low temperatures of minus 5 to minus 40F?**

**We have a freezer cabinet designed to operate at minus 40F. Refrigerant -12 is used and the system condensing**

unit same as used successfully in hundreds of similar sets. This particular unit is not getting full capacity. The installer used 80 ft. of 1⅛ in. suction with five standard ells and an additional 75 ft. of ⅞ in. suction with 15 standard ells. Long sweep ells were specified. Charts requested may prove difference in pressure drops between ell designs as accounting for capacity shortage.—J. S., St. Louis, Mo.

### Refrigeration Uses In Blood Plasma Processing

QUESTION NO. 1141: Can you describe briefly the process for refrigerating blood plasma? What temperatures are involved and what type of equipment is used? Are there any extensive installations or is this always a small scale operation?—A Blood Donor Chairman, Chicago, Ill.

### New Refrigerants, or New Names?

QUESTION NO. 1142: In October, Question No. 1131, the term "Refrigerant-12" is used. Is this another new so-called safe refrigerant, or a general term for all brands of dichlorodifluoromethane?—G. V. O'N., Chicago, Ill.

### Neoprene For Portable $H_2O$ Tanks?

QUESTION NO. 1143: Rubber protective coating described on pg. 8, August I. R., suitable for brush or spray coating may solve some of my interior tank coating problems. Can it be used in hot water tanks for human consumption? Will it contaminate food or water for human consumption? Is it toxic to apply?—J. A., New Orleans, La.

# News Notes and Chapter Activities

## Green Bay Chapter Tours New Ice Cream Facility

*WEST DE PERE, Wisc.*—September 12 meeting of Green Bay Chapter, NAPRE, was a plant visit to the new ice cream manufacturing facility of Morning Glory Products at West Depere, Wis. Armin E. Reinert, a chapter member, chief engineer of Morning Glory was host. He took the group through the plant first and then explained the workings of the equipment from a large wall chart.

The majority of the plant runs on liquid recirculation and temperatures are maintained in the low temperature sections by suction temperature control. A multi-step controller actuates as many as twelve steps of capacity over four multi-cylinder machines. Even the ice cream freezers operate on continuous liquid recirculation. Many questions from the floor were answered by Reinert.

In the business meeting, Chapter Past-President Lester Winkler suggested Green Bay now make its contribution to the Venemann Fund. Winkler also reported on activity of State Vocational Education Officers meeting at Green Bay. Another Past-President Lambert Bodart suggested President Amos Vierbicker appoint a committee to look into possibility of cooperating with the Vocational School on our instruction course, which action was taken by the chair.—Jim Schouten.

## September Triple-Header For New Orleans, NAPRE

*NEW ORLEANS*—Three get-togethers highlighted the September activities for Louisiana Chapter No. 2. On September 12, the regular educational session was conducted by Prof. Tom Stokes with a sizeable crowd. The membership contest was concluded at this meeting and prizes were awarded to the individual winners. John Funel won first prize, Leo Vivien, second prize and Joe Arena, third. The winning team, composed of ten members, will be feted at a dinner due to their efforts in bringing in delinquent members and new ones.

On September 22, a stag party for all members was held at a private camp on Lake Ponchartrain. Lots of seafood, cold cuts, hot dogs and beer were consumed. Card games and bull sessions were very popular. Members, including local President Damian Fischer, thanked Entertainment Chairman Gerald Vieages, for doing such a swell job. Hurricane Flossy was probably due to all of the commotion caused when the boys got home. These southern gals can really blow up a storm.

On September 26, all were back at the regular meeting, held at the Roosevelt Hotel. "Humidity in Refrigeration" was the topic from the Guy R. King course, *Basic Refrigeration*.—John N. Mariakis.

## Tampa Elects New Officers

*TAMPA*—Florida's newest chapter celebrated its first anniversary with the election of officers on August 27. New officers nominated and elected that evening are as follows: President, Bob Seiden, Borden Co.; 1st Vice-President, Joe Bustelo, Southern Equipment Co.; 2nd Vice-President, Russell Kraiker, F & M Service; Fin. Secy. & Treas., John G. Holzberger, Typhoon Prop-R-Temp; Corr. Secy., Merle O'Berry, Typhoon Prop-R-Temp; Sgt.-at-Arms, Richard D. Small, Typhoon Prop-R-Temp and Chairman Educational Committee, C. Scott Johnson.

## Milwaukee Elects Officers

*MILWAUKEE*—Highlight of the first fall meeting of Milwaukee Chapter NAPRE, was the annual election of officers. John Alberte, Schlitz Brewing Company was elected president; Harry J. Behnke, Cudahy Packing Company, was elected 1st vice-president; S. A. Tomkowiak, Vilter Manufacturing Co., 2nd vice-president; L. J. Anderson, BenHur Mfg. Co., secretary; Clarence A. Tondreau, Ben-Hur Mfg. Co., treasurer and C. W. Wawrzonek, Ben-Hur Mfg. Co., sgt.-at-arms. C. W. Stoner, H. J. Behnke, C. H. Randolph and E. P. "Pat" Kelly, were elected directors with Alberte, who serves as chairman of the board as well as president.

Visitors at this meeting were NAPRE's Vice-President, Bert C. McKenna and J. R. Kelahan, National Secretary. A portion of the meeting was given over to the discussion of a proposed regional educational conference to be held in Milwaukee in April 1957. A petition was drawn up at that time and transmitted by these national officers to the NAPRE Board of Directors.—L. J. Anderson.

## Denver Meets at Coors Brewery

*DENVER*—Colorado Chapter of NAPRE at Denver met at Coors Brewery for the first fall session. Coors went all out to show members and their families a good time. In their beautiful reception room members and guests met congenial hosts and registered. All received a miniature beer mug and a descriptive brochure; then adjourned into their bar and dining room. The group was then divided up and the women took the regular tour described in the brochure.

The men were taken through the boiler and engine rooms by Don Walton, Utilities Chief Engineer. Coors have two large boilers operating at 420 lbs. pressure and approximately between 60,- to 100,000 lbs/hr. They have an ingenious gas burner they made themselves to use gas on the off season when rates are low. The complete burner assembly is removable and the stokers are of the roto type.

Coors have a vertical steam turbine feed water pump, which many members had not seen before, and electric standby. Also on one side of the boiler room were two de-aerators. They were new to a number of members. Each has a capacity of 125 tons each. For any not familiar with them, they use a steam jet to create a vacuum and chill water.

### Four Units Produce 1500 TR

From the boiler room the tourists went into the engine room. There they have two steam turbines with a generating capacity of 1500 k.w. Process steam at 40 pounds is bled from turbines. Also in the engine room are two vertical, two-cylinder Yorks with a total capacity of 500 tons. Members then went into the new section of the plant where they had two centrifugals rated at 500 tons each. They are driven direct by steam turbines at speeds to 6000 rpm. They were re-tubing one of the machines and members had a chance to see what happens when a control fails and a unit freezes up.

Members then met the women in the auditorium and after door prizes were given out, some beautiful motion pictures of the Colorado Rockies were shown. These pictures were taken by some 25 amateur photographers employed by Coors. They showed all four seasons, starting with winter scenes of the snow covered mountains, and skiing; spring and all the

beautiful flowers. They showed two scenes of trout being hooked and landed (about three pounds) that really made members want to go fishing. Next came summer pictures of swimming, boating and water skiing. The fall picture showed the Aspens in full color and a deer hunter stalking a deer (and missing a good easy shot). Then the picture closed with more winter scenes.—M. A. Florida.

## Maintenance Problems Featured on Southern California Forum

*LOS ANGELES*—Special maintenance problems was the feature topic of a panel discussion on the educational program at the Terminal Club, October 3rd, as Los Angeles Chapter, NAPRE, held its first Fall business and technical session. The program was arranged by Guy R. King, chairman of the chapter's educational committee, who also served as moderator of a four-man panel named to answer questions on problems and procedures of plant maintenance.

Serving on the panel were Regis Gubser, chief engineer, and George Paulick, plant engineer, of California Consumers Corp; Herbert N. Royden, owner of Royden Ice Co.; and Lawrence H. Benedict, head of the Benedict Co. Procedure was to have each panel member in turn describe some interesting maintenance problem which had come up in his organization and then explain how the problem was solved.

Paulick kicked off the discussion by relating a corrosion problem that had threatened some condensers at the California Consumer Corp's Fourth Street plant in Los Angeles. The problem, as explained by Paulick with the aid of diagrams on the blackboard, involved the reinforcing of the foundation of some massive shell-and-tube condensers which were on the verge of shifting and might damage the coils to the extent of causing leaks.

Involved were a battery of four S&T condensers of eight to ten tons weight each. The steel supports had corroded to such extent that replacement was indicated in order to bolster the machines. Paulick described how the set-up was reinforced with I-beams to correct the condition, how supplementary support plates were welded between condensers and I-beams, and discussed the type of weld applied and the corrosion resistant compound which was applied to prevent corrosion at the weld points.

### Machinery Foundations

This led to a discussion of foundation bolts and how deep they should be driven. In reply to a question from the floor, Royden replied that, in most cases, detailed specifications are provided by the manufacturer. On the whole, he declared, the depth to which bolts should go, is governed by the type of machine involved. A 10x10-inch machine, he said, will take a foundation at least five feet feet deep and the bolts should extend nearly to the bottom.

The subject was elaborated upon by Gubser who explained that for a horizontal machine the foundation should be three to four times the mass of the machine, and relatively less for a vertical unit. Bolts, in Gubser's opinion, should extend at least two-thirds of the depth of the base.

The panel members joined in comment on the preliminaries that should precede condenser and compressor overhaul. They warned that before the machines are shut down, careful check should be made on how the machine is functioning just before being shut-down for overhaul. The check should include how much vacuum it pulls, how much oil it pumps, do the connecting rods need tightening, etc. A clear picture of the machine's capabilities and what is wrong, will make for a more efficient overhaul, the panel stated.

The subject of solenoid valves and servicing and repairing them was brought up by a member and was tossed back and forth in a spirited discussion for some 20 minutes. The preliminary class was conducted from 7 to 8 p.m. with 15 students present. Guy R. King served as instructor on the subject of "Principles of Electricity."

### Traveler Heard From

Five new members were accepted at the business session which preceded the educational phase of the meeting. Secretary Donald Byl regailed the members by reading a humorous letter from Flavil C. "Cash" Register, the chapter's traveling member. Register is assistant superintendent of air-conditioning for Holmes and Narver, Inc. of Los Angeles. He usually spends ten months of the year supervising the installation of refrigeration and air conditioning equipment in the South Pacific islands and other far places on the globe.

The letter read by Byl revealed Register to be in Saudi Arabia, where he is directing the installation of equipment for a Holmes & Narver client near the Persian Gulf. His humorous remarks and pithy comments on people, things and practices in the land of Araby provided some moments of hilarity for the chapter members.

### Ham-n-Beans Meeting

The Chapter launched its fall schedule with the traditional Ham-and-Beans dinner on September 19.

The program opened with a social period from 6 to 7 p.m. at which the Chapter's first Vice-president, Victor A. Stubblefield, served in his annual role of dispenser of social amenities. Miss Irma Vail, Hollywood pianist, who had provided some relaxing music for these affairs in years past, had again been engaged by Entertainment Committee Chairman Ed. L. Nelson to provide the musical accompaniment to a melange of old-time songs. With more gusto than rhythm, the refrigeration men tackeled such old favorites as "Down by the Old Mill Stream", "Roll out the Barrel," and "Girl of My Dreams."

A ham-and-beans dinner was served in the Terminal Club dining room from 7 to 8 p.m. W. B. O'Connor of Pacific Fruit Express served as master-of ceremonies at the introduction of guests and distribution of prizes. Among the guests were Averell Cole of Chicago, National Public Relations Chairman; Robert McKee, San Francisco Chapter, engineer with Pacific Fruit Express; and Edward Faulkner of Crystal Ice & Cold Storage Co., Phoenix, Ariz. William A. Brittin, a 30-year-member and past-president, announced he had resigned as chief of the engineering department of the city of San Clemente, Calif., and had joined the staff of Powers Refrigeration, Los Angeles.

NAPRE members in this area have been advised by the Chapter Educational Committee that a number of night school engineering courses are available to them this fall. The courses are being offered by the University Extension Division of the University of California at Los Angeles, and are scheduled to be held once a week from 7 to 9:30 p.m., beginning in mid-September. The courses include the following subjects:

Heat transfer and thermodynamics, including concepts of temperature, first and second laws of thermodynamics, properties of perfect and real gases, thermodynamic properties of fluid, and relationships between thermodynamic functions and applications to properties of matter. The instructor is William J. Flaherty, senior engineer, Aerojet General Corp;

Practical Air Conditioning, a course in applied air conditioning, including discussion and application of estimating heating and cooling loads, psychrometrics, refrigeration machines, blowers, pumps, boilers, furnaces, sheet metal duct design, air distribution etc. The instructor for this course is Howard N. Helfmann, Vice-president, Climate Air conditioning Co;

Other course are being offered on industrial heat transfer, industrial waste disposal, and hydraulics and pumping machinery. W. F. Gabor, project engineer of Pabst Brewing Co., Los Angeles, will teach the latter course.

## Compressor Drives and Review Mid-South Meeting Topics

*MEMPHIS*—Tennessee Chapter No. 1, is fortunate in having an instructor who apparently has unlimited access to cut-aways of various types of equipment. When the chapter was prepared to discuss compressor drives on September 19, its director, H. L. Todd, showed up with a cut-away of an electric motor. He backed up his demonstration of this model by means of his usual chalk-talk.

In explaining the more important features of Chapter 12, *Basic Refrigeration*, Todd emphasized the various type of electric motors, explaining their applications, advantages and disadvantages. Although his discussion covered other types of drives, most of the discussion centered around electric motors as they are most commonly employed in this vicinity.

At the October 3 meeting, Instructor Todd held an open forum once again on fundamentals. This was in the nature of

a review of Chapter 1 of the Guy R. King text. As the fall sessions get under way each year it is the practice of this chapter to go back and review fundamentals before proceeding with the year's program.

Todd also discussed safety measures for refrigerating plants, referring to an article on an ammonia receiver explosion which appeared on page 22, July 1952, *Ice and Refrigeration magazine*. His leadership brought out considerable discussion among the members of this very important safety topic.

Memphis Chapter, NAPRE, continues to obtain and distribute useful tools at each meeting, most of them supplied to the chapter through the courtesy of associate members and Memphis business houses. L. C. Waldrup Chief Engineer, King Cotton Hotel and Joe F Rook, Chief Engineer, Stewarts, Inc., were elected to membership.—Chas. Conley.

## Lubrication Topic At Seattle

*SEATTLE*—First regular meeting of Washington No. 1 Chapter was held on Thursday, September 20, in the Orkilla Room of the Downtown YMCA. Bob Harrison, chapter instructor, took the members through the chapter on Lubrication in the Guy R. King course. Speaker for the evening was Mr. Dick Ballinger of the Ansul Chemical Co.

Mr. Ballinger is considered an expert in this field and it was deliberately planned that he would talk on lubrication after Bob Harrison had reviewed the chapter in the Guy King course, so as to give the members the greatest insight into the subject of lubricating oils. He started off by saying that lubricating oils are divided into three categories: mineral, vegetable and animal. As both animal and vegetable oils will saponify, they are not suitable for use in the refrigeration field. Mineral oils are divided into two classes, Eastern and Western. Eastern oils have a paraffin base which is a disadvantage in low temperature work. Western oils have a naphtha base and is considered a more suitable oil for lubrication in low temperature work, particularly with the Freon's where low temperature is employed.

Lubricating oils are subject to certain tests and Ballinger reviewed some of them.

*Viscosity*: What is viscosity - it is the thickness or thinness of an oil and is measured or determined by the rate of flow of the oil at a determined temperature. The recognized standard is the Saybolt unit and is the number of seconds that an oil will take to flow through a constant orifice at a constant temperature, which in this case is always 100 degrees Fah. The more highly refined an oil, the thinner it is and the lower its viscosity. It is always advisable to follow the manufacturers recommendations in the use of lubricating oils but it can be borne in mind that a 150 viscosity oil is usually used in low temperature work.

*Floc or Cloud Point* - is the temperature at which the wax will separate from the oil and become visible. As lubricating oils are not wax free then the floc point is important as a wax deposit can gum up expansion valves, capillary tubes, etc. An oil with a low floc point is therefore recommended for lubrication. Mr. Ballinger had with him a laboratory cold testing device operated by dry ice and with this apparatus he lowered the temperature of oils and showed us the effect of wax separation.

*Four Point* - is the temperature at which the oil will start to flow. In lubrication it is important to have an oil which will reduce friction and so it is necessary to know at what point an oil is effective or not. The pour point is determined by first filling a test tube with oil, then freezing it to a solid, the test tube is then laid on its side and the oil heated, the temperature a which the oil starts to run is the pour point. A low pour point is desirable for many reasons, among them efficient lubrication and the avoiding of insulating the inside of evaporator coils.

*Steam Emulsion Number* - Is the number of seconds required to separate oil from water. A high steam emulsion number shows that the oil has been poorly refined and contains impurities. These impurities will pick up water if it comes in contact with wet surfaces. This water is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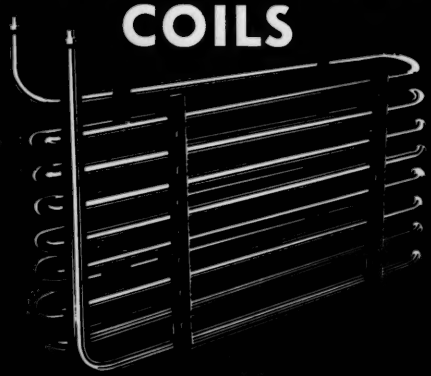

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bad and is to be avoided as it causes a great deal of harm. It will enter the refrigerant and cause it to break down into acids, it may also cause copper plating, so it is important to use an oil with a low steam emulsion number.

*Dielectric Strength* - Is the ability of the oil to resist an electric current and is measured in thousands of volts or kilovolts. Here we come back again to the presence of moisture and foreign matter. If the oil is free from these substances then it will resist the passage of electricity and have a high KV rating. In hemetically sealed units it is very important to have a lubricating oil with a high KV rating.

*Neutralization Number* - Is the measurement of organic and mineral acids in the oil. A low neutralization number shows there is virtually no acids, either mineral or organic in the oil.

*Color* - Lubricating oils vary in color from dark to white. Most suitable in the refrigeration industry is a straw colored oil. A dark oil is not as highly refined as a light oil and will not stand up to low temperatures. Mr. Ballinger pointed out that an oil should be a dry oil, that is it should not be able to absorb moisture and lubricating oils should always be stored in closed cans and drums to exclude air and the presence of moisture. The moisture itself is not harmful, it is oxygen that causes the damage. Oxygen will cause the oil to break down, will form carbon deposits on the discharge valves, and is the cause of discoloration of the crankcase oil.

*Flash Point* - is the point at which an oil will give off vapor that could burn.

*Firing Point* - is the point at which continuous combustion will take place and is usually 20 to 30 degrees above the flash point.

## Disagree On Discharge Heats

This led to a discussion on discharge temperatures, its effect on the oil and efficiency in general. It was generally conceded that bad valve seating, superheat in the suction line and air will cause high discharge temperatures. Sombody asked what the discharge should be. Roy Griggs said that 275 F was about the average. This writer has managed vertical compressors in the Tropics where the discharge temperature was 320 degrees and sometimes even higher. Frank Knowles, past president, said he knew a plant in Seattle consisting of horizontal water cooled compressors that operated at 400 degrees and operated very satisfactorily.

Mr. Ballinger said that there is such a thing called "Spot Temperature" that is the actual temperature of the discharge gas through the discharge valve orifice. There is actually a blue heat on the valves and the temperature is about 800 degrees, and although the oil may have a flash point of 340 degrees no harm is done if the moisture content is at a minimum. There was some talk about an explosion taking place as sometimes does occur in an air compressor where the cooling water has failed, and it was pointed out to the members that $NH_3$ will not burn at this point as there is not enough air present to sustain combustion.

In ending his talk Mr. Ballinger said that a lubricating oil should be a dry oil as moisture in oils can cause foaming and as this does not worry us too much with ammonia it is important in the "Freons." Foam retarder is often used with Freons consisting of a silicon base.

Charles F. Elliot, Operating Engineer & Research Machanic of Boeing Airplane Co., elected a member.

### Member Recovering From Wounds

William Peck, a Seattle Chapter member, was given considerable publicity in the Seattle newspapers recently in connection with a claim he has against the Federal Government. About 18 months ago Peck was engineer of the Arctic Maid, a fish freezing vessel operating off the coast of South America. A gun boat of the Ecuadorian Government fired on his vessel. Peck was badly wounded and after five operations, he is still confined to bed and further handicapped by plaster casts which cover most of his anatomy.

Since U. S. vessels and nationals are protected by treaty between the United States and South American governments, concerning fishing rights, etc., Peck and his employer have filed claims with the State Department against the Ecuadorian Government. This member has seen medical expenses and living costs eat up his savings, but he has faith that our government will recover for him and also secure substantial recompense for his ordeal.

The shooting occurred some 30 miles from land. Ecuador claims waters up to 200 miles off the coast belong to her, whereas Uncle Sam only recognizes a three-mile limit. The three-mile limit is actually recognized in international proceedings and our treaties with these other governments contain such provisions. — John Grainger.

## Aussie Member Becomes Air Conditioning Engineer

*New Orleans*—Recently an Australian Member-at-Large reported a change of address. With his correspondence came an explanation and description of a new position — a practice which this columnist devoutly hopes all members-at-large will adopt. The member is George F. Wyness. He writes: "My occupation at Macksville was chief engineer of a fairly large meatworks which I resigned to become installation engineer with the Australian branch of York Corp., a firm which is well known in your good country.

"I am very keen to become an operating engineer in the air conditioning field which here in Australia is only in its infancy and in my opinion you have to get into the ground floor (so to speak) to find what its all about. The job I am installing just now is the air conditioning of a large 15 story building here in Sydney which when finished will have, I believe, 3,000 people employed in it and will be the largest office building in the southern hemisphere.

"The equipment consists of two 400-ton York centrifugal compressors which incidentally come from York in America; one 6-cylinder York VW "Freon" compressor, one 4-cylinder York VW "Freon" compressor, and 26 conditioning units. The conditioners mainly consist of chilled water cooling coils and hot water heating coils for winter use. The air filters are Westinghouse electronic precipitators.

"We here in Australia look towards you in America as the leaders in the refrigeration field and most of our ideas are copied from yours. I look forward every month for the arrival of your INDUSTRIAL REFRIGERATION journal and when it arrives my wife tells me she can't get a word out of me until it is finished, and is certainly very interesting and full of information. It certainly is a credit to its organizers and one of the best I have read."

### Prospects Improve For Portland Chapter Revival

Capable and efficient Phil Gilmore, former secretary of the membership contest winning chapter at Tacoma, Washington, was recently transferred by his firm to Portland. Tacoma's loss, NAPRE officers hope, will be Portland's gain. With over ten members-at-large in that vicinity, Phil and other Oregonians should be applying for a Charter soon. He writes: "As many members must know by now, I had to resign as Secretary to Washington Chapter No. 2 and turn the duties over to the very capable Jim Bennett, because of leaving Tacoma to take a bigger job in Portland, Oregon. This is in the nature of a promotion and transfer to the Northwestern Ice and Cold Storage Co.

"I am assistant under Lynn Mills who is Chief Engineer. This company has four large freezing and storage plants here plus a 300-ton complete ice plant. I have supervision of refrigeration operations in three plants, widely separated through the city, so I am kept pretty much on the run.

"One of these plant's, (the Davis St.) operations is quite unique, I think. It's a fairly large plant with five floors developing about 1,500,000 cu. ft. of storage and freezing space and not a ceiling or wall coil in it, and with no defrosting ever needed. All rooms have Niagara 'No Frost' wet diffusers in them with all glycol piped to a central concentrating system in the basement.

"This enables us to hold storage rooms at zero to minus 5 F with a 10 or 11 psi suction pressure. Its efficiency is amazing. This plant has a total connected horsepower of 1800. All Worthington compressors are driven by 2300 volt synchronous motors. Three York rotary boosters and one 10 x 10 Frick compressor are driven by induction motors.

"It looks like I won't be able to attend the convention in Detroit this year as a Tacoma delegate. However, we may be able to start a chapter here in Portland, if enough interest can be aroused. There is enough refrigeration in this area to support a large chapter. There are 20 or more large freezing and storage plants within a radius of 30 miles, besides numerous dairies, milk processors and breweries. If the national office or any members have the names of anyone in this area interested, send them to me and I'll look them up". (He got the names from NHQ; — anybody else?)—Frank Chase

## Tour of Pie-Freezing Plant Provides Attraction For Stockton-Modesto Chapter Meeting

*STOCKTON*—First Fall event for the Stockton-Modesto Chapter, NAPRE, was a tour of the C. J. Swanson turkey plant in Modesto on September 18. This tour, under the guidance of Harry Greenwood, NAPRE member and Chief Engineer, was not limited to the engine room or the refrigeration facilities. Member and guests were able to watch the entire production of turkey dinners and pie manufacturing, from the killing plant to the freezing rooms and subsequent shipping to consumers.

### Color Coded Engine Room

The tourists went to the engine room for a short time and saw the compressors and other equipment. The equipment is automatically controlled and color coded. It was very interesting but not enough time was spent in that section of the plant to elaborate on the systems, here. After leaving the engine room the tourists went to the plant's killing room, saw the conveyors used in handling the turkeys and machinery used for picking the birds.

Members and guests then went to the section of the plant where they stored their products and had their freezing tunnels, and from there into the assembly plant where ingredients are cooked. Here the spectators saw them make up their TV—Dinners and turkey pies.

### Frozen Pie Manufacturing

Everything is on the assembly line basis, from the dough machine to the finished product. A machine automatically places pie crusts in aluminum foil pie tins which follow along to a machine that places the correct amount of cooked pie filling in the tins; then on to workers who put the partially cooked turkey meat, which has been previously weighed on scales, into the pie; and on they move on to another section where the top crust is placed on the pie and cut and edges crimped to size.

A machine on the order of a paddle wheel then presses the pie crust solidly on the pie which continues on the conveyor to another machine which is timed to place each pie individually into a box, and then on to the end of the conveyor where they are stacked in crates. The turkey pies are then moved to another section of the plant where machines operated by workers place and seal cellophane wrappers on each pie and then along to the final step which is placing a certain number of turkey pies into cardboard boxes for shipment to dealers. Everything in the plant appears to be made of stainless steel and people are employed continuously to clean and service the equipment.

### Division of Campbell Soup Co.

The Swanson firm is now a division of the Campbell Soup Company. However, poultry continues to be the Swanson specialty. The firm is reputed to be among the first poultry freezers and meat pie processors.

In addition to turkey pies and TV-Dinners, Swanson's have a department in the plant which takes care of boning turkey which is cooked and canned for more immediate consumption than the frozen product.—H. C. Dyer.

## Orman H. New

ORMAN H. NEW, longtime member of the California No. 1, NAPRE, died September 13. He passed away suddenly following emergency surgery. Mr. New was the son of the first Chief Engineer of the Swift & Company plant in San Francisco and had therefore been connected with the refrigeration industry all his life. One of his earlier jobs was with the Golden State Dairies in 1934. In 1941 he was working for the Lucky Lager Brewing Corp., as assistant engineer. From 1941 to 1945 he served as refrigeration engineer at sea with the Maritime Commission. Following the war he worked for Cyclops Iron Works, Industrial Installations, Merchants Ice, and at the time of his death he was working for the Spreckles-Russell Dairies. Mr. New contributed greatly to NAPRE through several years as treasurer and in 1943 he was president of California No. 1.


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## Chicago Section ASRE Opens 1956-57 Program

CHICAGO Section ASRE opened its 1956-57 program on September 13, with a speaker who discussed the design of the Axial type refrigeration compressor.

William K. Steinhagen, of the Power Development Engineering Staff from the General Motors Technical Center gave an interesting and stimulating paper on not only the design aspects of the Axial compressor but also how designers call upon specialists in the fields of research, testing and manufacturing. Mr. Steinhagen, a graduate of the University of Michigan in 1948 with a MSE degree came with General Motors as a junior engineer in the power development group. At the present time, he is a staff engineer in charge of projects on household appliances, home heating and automotive accessories.

Mr. Steinhagen began by saying that work on the automotive air conditioner first began in 1938 with the gas-driven engine unit in the rear of the automobile. The first unit for commercial production was produced in 1952, but the sales department of General Motors found that the unit was too heavy, too large and too expensive. His group then called upon specialists in the fields of research, testing and manufacturing to weld their knowledge into a design of an acceptable, commercial product.

The Wobble Plate compressor was the first proposal. It was a reciprocating compressor. At speeds of twenty-five miles per hour, it could generate a ton and one-quarter of refrigeration, which was enough to cool a commercial automobile satisfactorily. Some of the problems mentioned were that as the designers went to more glass surface, Mr. Steinhagen's group was called upon for more refrigeration capacity. Also, it was difficult to control the capacity at high speeds.

Mr. Steinhagen concluded his talk by telling the group that the Axial type refrigeration compressor reduced the weight, the cost and increased the efficiency of the refrigeration unit for the automobile industry. When asked of the possible future of the unit for commercial use, the speaker would not answer definitely. However, he did give the impression that this was a project on which he was continuing to work. A one-ton unit that would do the work of the present three-ton unit at the same cost at a reduced weight and space factor offers many possibilities, he stated.

## Underground Cold Storage Project in Norway

A REFRIGERATION and cold storage plant has been installed in the Ekeberg mountain halls on the outskirts of Oslo, Norway near the Oslofjord. Construction of the project was based on similar installations in the United States. The plant has a freezing capacity of about 1,000 tons. The up-to-date facilities have been leased to the Norwegian Meat and Pork Producers' Association for three years. This is the first of its kind in Norway.

The Ekeberg mountain hall in which the cold storage plant was installed was primarily designed as an A-bomb shelter. Blasted into the mountainside over a period of two-and-a-half years, it was completed last spring. The two-story warehouse includes 48 rooms built of concrete blocks with a floor space of about 343,000 square feet. Outside the owners have erected an office building for tenants, with snack bar and recreation room for plant workers.

Only the partition walls are insulated, the surrounding mountain rock walls forming an insulation barrier. The plant has excellent transportation facilities, and is located only a short distance from railway and pier. Meat trucks load and unload at the entrance. Suspension conveyor rails carry the incoming carcasses directly from trucks into the quick-freezing rooms where the temperature is kept at 35 F below zero. From there, they move on to the storage rooms, maintained at a steady minus 31 F. Other meat products, not suitable for conveyor rail transportation, are brought into the plant in trailer trucks, which pass through a locker with doors at each end. Illumination is provided by neon lights.

The ventilation system changes the air twice in the course of every hour. The rooms are heated in the winter and cooled in the summer. Relative humidity is maintained at 60 percent. All of the 48 rooms have been leased to private companies and defense authorities for storage of many different kinds of products, including paper, building materials, radio equipment, and foods.

## New Storage Plant

THE AYER Storage Company Ltd. has announced plans to build a million dollar cold storage and freezing plant at Lancaster, New Brunswick, to handle Atlantic fish and fruit and farm produce. The plant will handle shipments from individuals, cooperatives and companies throughout the Atlantic provinces.

## Brazil Establishes Cold Storage Company

A GOVERNMENT-controlled company to build and operate cold-storage warehouses and railway, highway, air, and maritime cold-storage shipping facilities in Brazil has been authorized by law No. 2854 of August 28.

The new company, Frigorificos Nacionais Sociedade Anonima (Frinasa), may not enter into trade in cold-storage products unless it is specifically authorized to do so by the Government in event of public need.

The company's authorized capital is 50 million crezeiros, of which 52 percent will be subscribed by the National Treasury and the remainder by private individuals or groups. The capital may be increased to 100 million cruzeiros by the issuance of preferred shares and the company is authorized to issue bonds as necessary for its business.

Frinasa is exempt for five years from tariff and other customs charges for the import of machinery and equipment necessary for the installation and operation of cold-storage warehouses, as well as refrigerated vehicles and ships, provided that similar items are not produced in Brazil. Exemption also is granted for a period of 10 years from all types of Federal taxes except income tax.

Private companies, especially cooperatives, organized for the same purposes as Frinasa, also may be granted the tax exemption privilege if their plans meet certain conditions of approval by the Ministry of Agriculture, and they conform to a schedule of rates and charges approved by that Ministry.

## Frozen Concentrated Milk

IT IS encouraging to observe that competent research continues on problems associated with freezing and holding of concentrated milk. Canadian research workers, Dyson Rose and H. Tessier (Nat'l Research Laboratories, Ottawa) have published several papers recently on results of their studies with interesting new findings. They have learned that at freezing temperatures, crystallization of milk sugar (lactose), which is related to precipitation of casein, is controlled by temperature, supersaturation and activity of nuclei and that moderate heating (up to 150 F for 30 min.) tends to increase storage life. Severe heating and holding at 35 F before freezing tend to shorten the period of holding.—TRRF Bulletin.

## Ice Sells Topcoats in Mid-Summer

*Weiner's clothing store in downtown section of Portland showing piles of pulverized "snow" ice.*

FOR the third successive year Weiner's clothing store in Portland, Oregon kicked off its mid-summer topcoat sale with snow piled high on the sidewalk in front of the store; snow ice, that is. Six to eight hundred bushels of this snow gave shoppers and would-be customers that brisk winter feeling, although it was only the last week in July.

About 6:00 o'clock on the morning of the sale the Liberty Fuel & Ice Company dumped the pulverized ice on the sidewalk along the curb line, piling it up so that it did not take too much room on the sidewalk and so it made an impressive sight.

The store was well pleased with this advertising stunt, as evidenced by the repeat this year for the third time. The store where the picture shows the display is in the heat of downtown Portland, and another Weiner store is in the Hollywood section of Portland, where a snow-ice display also was made.

### He's for Ice Not Ike

ALVIN Hatten, well-known Independence, Missouri, Iceman and Jackson County Revenue Collector, was stopped in the lobby of the Hotel Sherman, Chicago, during the Democratic Convention to which he was a delegate, by two Georgia Republican delegates enroute to San Francisco for their convention. Pointing to his big round blue and white badge, Hatten was told how glad they were to see another Republican amid the Democratic throng. Soon Republican faces became red when a closer look at the badge revealed that Alvin was proudly displaying an I LIKE ICE button.


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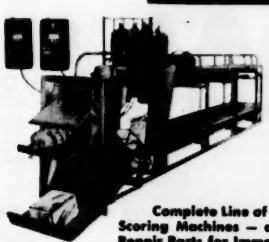

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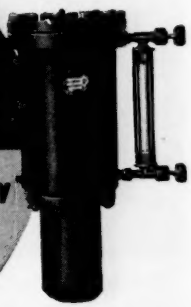

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NOBODY likes hand purging. It is a messy, smelly, time-consuming job.

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# Ice Carving Adds Decorative Feature To Opening of Packing Plant

A CARVED Ice display, illustrated below, was used in connection with the opening of the Northwest Packing Company plant in Portland, Oregon, a new plant for processing vegetables, after a fire had destroyed the former plant on the same site. The new plant was in operation 100 days after the fire, upon which the "100 Days" motif was based. The ice piece was made by the Koldkist Ice Company, Portland.

The display was approximately 60 inches long, 30 inches wide and 30 inches high. The bottom layer was made of three 200-pound blocks of ice scored into squares by V-grooves about one inch wide and one inch deep, making the surface of the ice into many faced jewel-like facets. A hollow space was cut into the bottom side of each cake and electric lights were laid beneath them. Different colored lights were used, each light on an individual flasher so they were constantly going on and off, making a rainbow effect and ever-changing color flow up through the ice.

The second layer was made from other cakes of ice in which there had been frozen a red fireman's helmet and in another cake about 10 cans of string beans which were the main product of the packing plant at the time of the opening. There were no lights in front of this second layer, but there were lights in the back in the open space between the cakes with the articles frozen in. Between the blocks with the helmet and the cans there was a pile of uncanned green beans. The letters "100 Days," were cut from yellow colored ice and were about 10 inches high, arranged in a semi circle to tie in the fireman's helmet and the canned beans.

*This ice carving display made quite a bit at opening of new Northwest Packing Company plant in Portland.*

## Ice Industry Plans New Promotional Film

AT THE meeting of the Board of Directors of the National Association of Ice Industries July 30 and 31, the Sales and Marketing Committee proposed that the Board give consideration to making a new up-to-date institutional film of the ice industry. The Committee felt that the Industry is not getting its story over to the public. It is recognized that some Icemen are doing a good job with local advertising. Others, for want of merchandising tools, are doing so little promotional work that the products and services of the industry are definitely not being kept before the consumer.

It was believed by the Committee that a new film would be one of the most useful and one of the least expensive methods of "putting the industry's best foot forward." Further, a beautiful film in color dramatically presenting the ice industry and its diversified services as they tie into the everyday wants and needs of the customer would be of great help to the Iceman in doing a local selling job.

According to preliminary plans the film would be entirely new. It would have a new title, a new theme, new script, a new story. It would include the modern trends and developments in the industry. To save on production costs, a few pictures would be lifted from "Naturally Yours," which has served well over the last ten years, but is now dated. Despite its age, "Naturally Yours," is still being shown, which further emphasizes the real need for a modern version of the ice story.

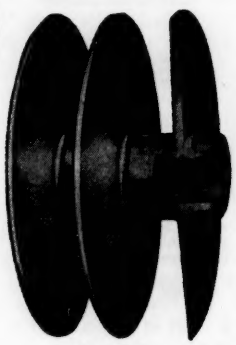
Before the Board acts on this recommendation they are asking members of the industry to return an enclosed post-card stating whether they would be interested.


**DIMCO CAST ALUMINUM FIN EVAPORATING COIL**

**The Ideal Refrigeration Surface for Cold Storages, Freezer Plants, Dairy Products, Packing Houses, Abattoirs, Breweries and numerous applications**

**DETROIT ICE MACHINE COMPANY**

**2615 Twelfth St., Detroit 16, Mich.**



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★ *Saves Weight*

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**CAN BE USED WITH ANY REFRIGERANT**

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## Icing Cod With Salt Water Ice

**(Continued from page 20)**

cessively low. However, the occurrence of strong salt brine and too low temperatures in parts of the ice might in practice be counteracted by adding small quantities of fresh or sea-water to the ice at the time of icing.

## Industry Turns Interested Eye on Cryogenics

**(Continued from page 3)**

& Carbide; Air Reduction Inc., and National Cylinder Gas Corp.

Benefits also have brought to industry for example by North American Philips Co. Inc., whose laboratories in Eindhoven, Netherlands developed a small single-cylinder gas liquefier. This machine liquefies various gases at temperature ranging from a minus 112 degrees to minus 328 degrees, which may be used to treat various kinds of steel. Much like heat treating improves certain steels, cold treatment can improve the durability of tool steels, increase the hardness of other steels and improve the properties of magnet steel.

Other uses of the gases include freezing usually soft plastics so they can be machined like metals, preserving sperm for use in artificial insemination and in investigating food preservation.

## Advisory Group to Meet

THE USDA Refrigerated and Frozen Products Research Advisory Committee has scheduled its next meeting for January 14-16. All interested parties are invited to submit written recommendations concerning industry and related problems that need research attention.

## 1957 Training Conference

PLANS are being formulated for another Training Conference by the Refrigeration Research Foundation and National Association of Refrigerated Warehouses at Purdue University, January 20-24, 1957.

## British Exports

DURING July, air-conditioning and refrigerating machinery (commercial and industrial sizes) to the value of £ 896,940, weighing 1,333 tons, was exported from the United Kingdom.

## NARW Executive Committee

GREETED by unusually pleasant Washington weather the NARW Executive Committee arrived in the Nation's Capital Sunday, September 9, for a strenuous two-day and one-night consideration of industry problems and plans. A staff presentation, "NARW in Operation — For Today and Tomorrow", given at Association headquarters, and followed by a tour of the NARW offices, was item number one on the agenda.

Luncheon was held at the Statler Hotel after which the Committee delved into association finances and operational policy discussions on national committees; government competition; the Cold Storage Report and other pertinent industry subjects.

A reception with government officials and dinner at the National Press Club provided a short respite from the business sessions. Margo Lucey, Miss America runner-up, was on hand for a few moments to bring greetings from Washington, D.C., which she represented in the national contest. After dinner, members reconvened for an evening meeting.

S & S has really started something . . . soon the whole country will know . . . the only way to become a "perfect host" is to always use ice man's ice (available in almost every U. S. city, from S & S Vending Stations). Free promotion kit containing decals, newspaper mats, releases to food editors, is yours for the asking. If you want to help spark up the sales of party ice, start right now by writing S & S for full details on the big new Perfect Host promotion and on S & S Vending Stations . . . the nation's leader for 28 years.

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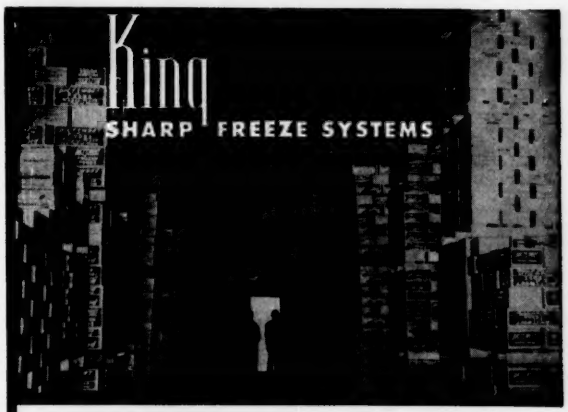


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More than 400 plant operators here and abroad have chosen King Systems for more efficient bulk freezing jobs for bigger profits. King Systems give you increased cold-room capacity, faster freezing, engineered distribution of air, continuous operation with no costly defrosting shut-downs, retention of product flavor and quality, lower power costs, a quick-freeze system designed for your specific needs.

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MANUFACTURERS OF SHARP FREEZE, COOLING, VENTILATING AND HEATING SYSTEMS

## Packaging of Fresh Produce

HALF of all fresh produce will be prepackaged by 1960 according to the prediction of Robert A. Cooper, Exec. Sec'y of Produce Packaging Assn. In 1950, only five percent of fresh fruits and vegetables were packaged. In 1955, the figure had quadrupled to 20 percent (USDA estimates). Reason: Reduction of 85 percent in previous heavy losses from waste and spoilage.

Now we learn that eggs may be re-packaged—taken out of the shells and packed in plastic containers, one for each egg. Then the consumer can see the egg she buys and can even cook it in its plastic cup. Cornell Univ., has promoted this idea. — TRRF Bulletin.

## Refrigeration and Storage of Fish

A REFRIGERATION manual on the processing and storage of fish is being prepared by the Fishery Technological Laboratory of the Fish and Wildlife Service, U. S. Department of The interior. It will consist of five parts: Cold Storage Design and Refrigeration Equipment; Handling Fresh Fish; Factors to be considered in the Freezing and Cold Storage of Fishery Products; Preparation, Freezing and Cold Storage of Fish, Shellfish and Precooked Fishery Products; Distribution and Marketing of Frozen Fishery Products.

The section dealing with the freezing and cold storage of fishery products, issued as Fishery Leaflet 429 was reviewed in the September INDUSTRIAL REFIGERATION. The other sections have been issued as separate "Fishery Leaflets". After a reasonable period of use by the fish processing industry, they will be revised as found necessary. They will then be combined into one manual. When completed, this manual will be perhaps the most comprehensive text published to date on the techniques for handling and preserving fish from the time when caught on the fishing vessel until consumed in the American home.

"Cold Storage Design and Refrigeration Equipment," published as Fishery Leaflet 427 covers cold storage design; refrigeration equipment; refrigeration requirements and freezing methods.

"Handling Fresh Fish", published as Fishery Leaflet 428, covers spoilage of fresh fish prior to freezing, handling, fish aboard vessel, and handling fresh fish at the shore plant.

"Factors to be considered in the Freezing and Cold Storage of Fishery Products", published as Fishery Leaflet 429 covers changes taking place during freezing of fish; changes taking place during cold storage of fish; protective coverings for frozen fish;

"Preparation, Freezing, and Cold Storage of Fish, Shellfish, and Precooked Fishery Products" published as Fishery Leaflet 430, covers fish, shellfish, and raw, breaded or precooked seafoods.

"Distribution and Marketing of Frozen Fishery Products" published as Fishery Leaflet 431 covers transportation of frozen fish, marketing of frozen fish, and locker plants and home freezers.

## COMING CONVENTIONS

**NATIONAL ASSOCIATION OF ICE INDUSTRIES**
November 13-16, 1956
Atlanta Biltmore Hotel, Atlanta, Ga.
Guy W. Jacobs, Secretary

**SOUTHWESTERN ICE MANUFACTURERS ASSN.**
November 25-27, 1956
Adolphus Hotel, Dallas, Texas
Gen. P. A. Weatherred, Secretary

**NATIONAL POWER SHOW**
November 26-30, 1956
New York Coliseum, New York

**DELTA STATES ICE ASSOCIATION**
December 2-4, 1956
Arlington Hotel, Hot Springs, Ark.
Mrs. Edna Vaughan, Secretary

**CHICAGO DISTRICT ICE ASSOCIATION**
December 12, 1956
Drake Hotel, Chicago, Ill.
Wm. Strauss, Secretary

**NATIONAL ASSOCIATION FROZEN FOOD PACKERS**
January 6-10, 1957
Fountainbleau - Eden Roc Hotels, Miami Beach, Fla.
Lawrence S. Martin, Secretary-Manager

**INDIANA-OHIO-MICHIGAN ICE ASSOCIATIONS**
February 25-27, 1957
Detroit-Leland Hotel, Detroit, Mich.

**INTERNATIONAL HEATING AND AIR CONDITIONING EXPOSITION**
February 25 - March 1, 1957
International Amphitheatre, Chicago, Ill.

**AMERICAN WAREHOUSEMENS ASSOCIATION**
April 1-5, 1957
Chalfonte-Haddon Hotel, Atlantic City, N. J.
Wm. Dalton, Secretary

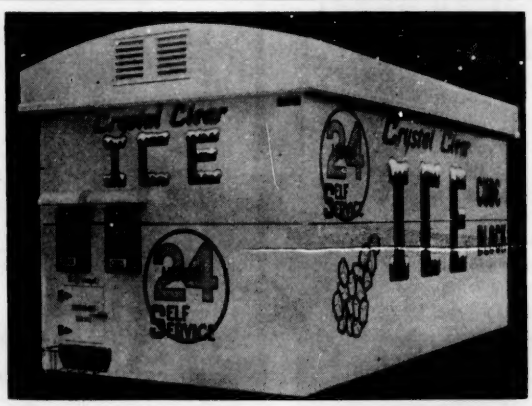
**NATIONAL ASSOCIATION REFRIGERATED WAREHOUSES**
April 1-5, 1957
Chalfonte-Haddon Hotel, Atlantic City, N. J.
Wm. Dalton, Executive Vice-President


**K. G. Brown Mfg. Co., Inc.**
**Mattituck, N. Y.**

**PRESENTS:**

**The Most Modern Automatic Ice Cube Vendor.**

- **Dispenses Cube, crushed, party and block ice**
- **Ready for immediate operation.**

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**The new low-cost 6' x 8' station vends more than 85 ten-lb. bags.**

**Write today for complete details on this Double Unit and other sizes and models.**

## DEATHS

### Clarence Birdseye

THE DEATH of Clarence Birdseye, inventor of the quick freeze food process bearing his name occurred October 7 in the Gramercy Park Hotel, New York, where he lived. He was 69. He had suffered a heart ailment a year ago but seemingly had been recuperating.

Birdseye's invention, which made him a fortune, put his name into the national vocabulary although few consumers of Birds Eye quick frozen vegetables, fruits and other foodstuffs realized the trademark was derived from a family name. He was born in Brooklyn, N.Y., and showed an interest in food preservation problems from childhood. He voluntarily took a course in cooking while attending high school in Montclair, N.J.

After working for a time as a naturalist for the United States biological survey, Birdseye went to Labrador as a fur trader in 1912. He became a friend of Sir Wilfred Grenfell, the medical missionary, and cruised with him in his hospital ship as he ministered to ailing fisherfolk.

Through that experience Birdseye noted the natives' urgent need for fresh food and found that foods frozen very quickly in the dead of winter kept their freshness as long as they were held at low temperatures. With this knowledge, he went to Gloucester, to be near a source of fish, and experimented with an electric fan, ice cakes and salt brine —equipment costing $7.

In 1924 quick frozen, ocean fresh fish fillets were the first of a large variety of frozen packaged food to be marketed. In addition to making Birdseye rich, the process helped revive the Massachusetts fishing industry, and was the basis of establishing the present frozen food industry.

### Albert Lundin

A PROMINENT figure in the ice and cold storage industry in southern California for a number of years, Albert Lundin, died in Huntington Park in August, 1956. At the time of his death Mr. Lundin was vice-president and general manager of Federal Ice and Cold Storage Co. of Mount Vernon, Calif. Prior to his affiliation with Federal, he had been manager of the Needles Ice Co.

### Coleman Rogers

THE DEATH of Coleman Rogers occurred at his home in St. Petersburg, Fla., September 11 after a lengthy illness. Primarily a publicity man and writer, he served as executive secretary of the Florida Ice Association from 1940 to 1947. Through this position he made many friends throughout the ice industry in Florida and adjoining states. He was a member of the Cleveland, Tenn., F & A M and the presbyterian church and was a veteran of World War I. He leaves his mother, widow, Anna B., two daughters and a son.

### P. F. Ferlise

THE DEATH of P. F. Ferlise, Birmingham, Ala., occurred August 8. He was 70. Mr. Ferlise was prominently identified with the ice and other related enterprises in the South during the past thirty-five years. At the time of his death he had ice and cold storage properties in Birmingham, Bessemer, and Ensley, Alabama; the New West Florida Ice Company in Sarasota and Bradenton and the Purity Ice Company in Lakeland, Florida. He also owned farming and other ice properties.


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Standard flanges: screwed sizes to 2"

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*Frick line includes fittings, safety valves, gauge glasses, return bends, manifolds and welded work.*

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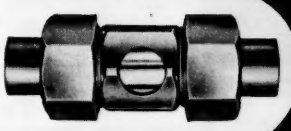
designed to save you even more time and money



6 sizes now available 3/8", 1/2", 5/8", 7/8", 1 1/8" and 1 3/8" ODS

The new "250" has all the proved Liquid Eye advantages *plus* these newly engineered features:

- smaller—more compact, simplified design.
- preformed copper extension eliminates need for separate gaskets—*foolproof* installation.
- complete, self-contained, economy unit.

*Ask your wholesaler now.*

*Write today for catalog covering the complete Allin line.*

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Photo:
Model C-1
(single unit)

**Perlan**

**Automatic Ice Vendors Sell handy bags of cubed or crushed ice.**

*(Visit us at Booth #22 in Atlanta, Nov. 13-16.)*

Write today for details on complete line of vending equipment. Dept. I-II.

REFRIGERATION ENGINEERING COMPANY
MONTGOMERY, MINNESOTA

# MANUFACTURERS' NEWS

## New Frick Branch Office

ANNOUNCEMENT is made by Frick Company, Waynesboro, Pa. of the opening of a new branch office at Palo Alto, Calif. This office is in charge of Alan J. Vandermade, and is located at 809 San Antonio Road. Mr. Vandermade was graduated from Rensselaer Polytechnic Institute in 1942, and from the U.S. Naval Academy in 1945. In World War II he served as an engineer division officer aboard a heavy cruiser in the Pacific. Since June, 1947, he has been actively engaged in the field of industrial refrigeration, doing engineering and sales work with a leading manufacturer of cooling equipment. His experience includes work in the dairy field, meat packing, food processing, cold storage, chemicals, oils, and other heavy industries. Mr. Vandermade will take care of the needs of Frick customers for medium and large sizes of refrigerating and air conditioning equipment. Smaller sizes will continue to be handled through franchised Distributors.

The Frick branch office in Philadelphia has been moved from the Witherspoon Building to 408 Wilford Building, Thirty-third and Arch Streets. Cyril Leech is Branch Manager.

*A. J. Vandermade*

*Wm. P. Sterling*

The PAPPAS Refrigeration Company has been appointed an authorized distributor by The Frick Company, Waynesboro, Pa. Pappas Refrigeration Company has headquarters at Houston, and branches at San Antonio and Beaumont, Texas. They will cover the Southern Texas area, handling Frick air conditioning and refrigeration, except in the vicinity around El Paso.

Announcement is made by Frick that William P. Sterling has been appointed assistant to J. A. Etter, manager of the Cincinnati Branch Office of the Company. Mr. Sterling attended Purdue University, and first worked with the Sterling Engineering and Machinery Co., at Schiller Park, Ill. Following this he was with the National Refrigerators Company of St. Louis, and in the St. Louis office of Baker Refrigeration Corporation. From there he went to Fort Richardson, Alaska, where he served as Refrigeration and Air Conditioning General Foreman of the Post Engineers, of the U.S. Army. Mr. Sterling's address in Cincinnati is 3705 Carew Tower.

## Jamison Names Hoffbauer Kansas City Manager

A. C. HOFFBAUER has been appointed manager of a new branch office in Kansas City, Mo., by Jamison Cold Storage Door Company, Hagerstown, Md. The office is located in Room 322 Ten Sixteen Baltimore Bldg., Kansas City 6. Hoffbauer will serve the company in the greater Kansas City area, the state of Kansas, and the western half of Missouri. A member of the Jamison sales organization for many years, he has had extensive experience working in the field with users of cold storage doors. In addition, his factory training will enable him to render complete sales service to Jamison customers.

*A. C. Hoffbauer*

## New Mojonnier Salesman

MARSHALL TATUM, a native born North Carolinian, has joined the Mojonnier Bros. Co. organization as Sales Engineer to serve the many Mojonnier customers in North Carolina and eastern Virginia. During World War II he served with the First Marine Division on Okinawa and China. An alumnus of North Carolina State College, Marshall's excellent engineering experience is expected to be of much practical value to Mojonnier accounts in the area which he is covering.

*Marshall Tatum*

## Olson Promoted by Taylor

HARRY G. OLSON, member of Taylor Instrument Companies' home-office industrial sales executive staff since 1942, has been named divisional sales manager in charge of industrial instrument sales to processors in the textile, air conditioning, refrigeration, and metal industries, it is announced by L. Lawrence Forward, general sales manager for Taylor Instrument Co.

Olson first became associated with Taylor in 1936 as part of its repair and repair-sales staff. In 1942 he was made assistant in a department formed to supervise industrial sales to the rubber, textile,

*Harry G. Olson*

and canning industries. Since then he has progressed through sales executive posts involving instrumentation, in addition to the industries just enumerated, for the air-conditioning, dehydrated foods, refrigeration, aircraft, and metals industries. His wide experience in the control instrumentation requirements of these various industries makes him an ideal choice, it is stated, for his new post. He has also played a prominent part in Taylor Instrument Companies' contributions to the widely publicized SAGE (semi-automatic ground environment) project of the U. S. Air Force.

## Dole Announces Changes In Executive Staff

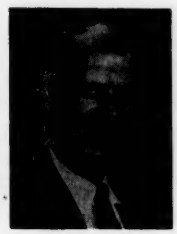
THE following changes in the executive staff effective October 1 are announced by The Dole Refrigerating Company, Chicago, manufacturers of the "Cel" line and pioneers in the industrial refrigeration industry.

*O. L. Rose*

*H. P Hansen*

*G. E. Frankel*

*J. E. Hutchinson*



*B. P. Tweed*

O. L. Rose, vice president, secretary-treasurer, and assistant general manager, will go into partial retirement, after eighteen years service with the company.

Harold P. Hansen, general sales manager, and former Canadian branch manager, has been appointed assistant general manager by E. J. Tweed, president and general manager of Dole.

George E. Frankel, Comptroller, was elected secretary-treasurer by the Board of Directors.

John E. Hutchinson, currently research and development engineer, will take over the post of general sales manager.

Bruce P. Tweed, western division sales manager, has been recalled to the home plant and will head the research and product development division.

# Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

### Positions and Help Wanted

WANTED—Maintenance man for large apple peeling, slicing and processing plant. Ammonia refrigerated cooler and freezer. Middle aged man satisfactory. Must be all around good mechanic. Plant located in New York State, 30 miles north of Poughkeepsie. Write, giving salary expected, to Box NV-4, c/o Industrial Refrigeration.

### USED EQUIPMENT—wanted & for sale

FOR SALE—Ice Plant. Now operating; 50 ton, Frick electric complete. Only ice plant in area with population of 50,000. The Enterprise Ice & Coal Co., Harriman, Tenn.

WANTED—Used ice plants, all sizes and makes. Write complete details to Box OT-7, c/o Industrial Refrigeration.

FOR SALE—complete 200 ton ice plant, 1250-400# cans. 4 York 10x10 compressors, operated with 125 hp. synchronous motor; coil, pumps, air compressors; everything that goes with the operation. Plant closed down 30 days ago. All in excellent condition; priced at liquidation prices. Must act fast. Gordon Equipment Company, 6530 W. Jefferson Ave., Detroit 17, Mich.

WANTED—300# block automatic ice cubing machine. Would prefer Gifford-Wood Type C A, 3 hp., 60 cycle, 220 volts. We would buy any good used full block cuber. Rainier Ice & Cold Storage, Inc., 6004 Airport Way, Seattle 8, Wash.

FOR SALE—4x4, 5x5, 8x8 York and Frick compressors. 15 ton condenser. 20" receiver. Write E. Niebling, 1546 St. Clair, Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE—Used ammonia equipment and compressors from 3 x 3 to 9 x 9 high speed, also motors. Write Gus A. Regnier Refrigerating Engineering Co., 532 Winchester Ave., P.O. Box 1093 New Haven, Conn.

FOR SALE—4 York vertical shell & tube condensers, new 1946, ASME code-stamped: 2 horizontal welded steel ammonia receivers, like new, located Washington D.C. Details by writing Box NV-6, c/o Industrial Refrigeration.

FOR SALE—Western location; Baker ammonia compressor, 16-12A, with Century 75 hp. induction motor, 1165 r.p.m., 2300 volt, 60 cycle, 3 phase, & Cutler Hammer starters, V-belt drive, with horizontal receiver, welded construction, 12" dia. x approx. 18' lg., & horizontal shell & tube type condenser, 38" dia. & approx. 23' lg. Still erected as last used, with hundreds of dollars worth of ammonia pipe, fittings, etc. Inspection invited. Offer is subject to prior sale. For further details write Box NV-8, c/o Industrial Refrigeration.

FOR SALE—1949 model Frick 6 x 6 ammonia compressor, cap. 15 ton, operating at 15.7 suction pressure, cost, new, approx. $2,500. Still hooked up at small plant in eastern Penna. for immediate delivery at a bargain price; inspection invited. Also in same plant is York 7½ x 7½ cap. 19 ton, at 15.7 suction pressure, operating at 275 r.p.m.; both units complete with motors, starters, and accessories; also 11x6x5 brine tank, 330 cu. ft. and 280 sq. ft. of coils; miscellaneous diffusers, etc. Individual items can be purchased. Your inquiries invited. Address Box NV-9, c/o Industrial Refrigeration.

**FOR SALE**

2—10"x10" 2 cyl. Frick D.C. to 100 hp motor.
2—10"x10" 2 cyl. York D.C. to 100 hp motor.
3—9"x9" 2 cyl. York D.C. to 75 hp motor.
1—8"x8" 2 cyl. Frick D.C. to 75 hp motor.
1—7¾"x5" Frick booster.
2—50 ton G.E. Freon condensing units.
1—50 ton Buffalo Freon evap. condenser.
1—6"x6" Frick compressor.
1—5"x5" York compressor.
3—9¼x14" 115 hp Wolverine Diesel engines.
11x22x47" and 11x22x51" ice cans.
Ice plant — 20 to 160 tons.

**ENTERPRISE EQUIPMENT CORPORATION**
77 Alexander St. Yonkers, N. Y.
Cable ENEQCO Phone: Yonkers 8-8118-9

FINNED PIPE FOR SALE—48 lengths 12' each Made from 2" steel pipe-7" square fins 1½" apart; galvanized. New at only $3.00 per foot. Also 100 steel Hand Trucks. Medium duty; roller bearing wheels. New at $6.00 each. West Side Cold Storage Co., 7 Harrison St., New York 13, N.Y.

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company 80 East Jackson Boulevard, Chicago 4, Illinois, WAbash 2-3299.

FOR SALE—Frick 10 x 10 Type H ammonia compressor with cap. 73.4 tons refrigeration, operating at 360 r.p.m., 20 lb. & 190 lb. ammonia pressures; used about 2 years only; with 125 h.p., 60 cycle, 3 phase, 220/440 volt AC motor & accessories; condenser size 35015 Type AE. This equipment is still erected and is available for immediate delivery at prices less than half of new. Details by writing Box NV-7, c/o Industrial Refrigeration.

**FOR SALE—AMMONIA—FREON**

1—3-¾x3"—8 cyl. V/W York belt driven ammonia compressor.
1—5¼"x4¼"—6 cyl. V/W York ammonia booster comp.
1—6-¾"x5"—6 cyl. V/W York booster ammonia comp.
1—25 ton Chrysler Air Temp. Freon condensing unit, complete.
1—40 ton General Electric Freon condensing unit, complete.
1—50 ton General Electric Freon condensing unit, complete.
1—50 ton Buffalo Freon evaporative condenser.

**ENTERPRISE EQUIPMENT CORPORATION**
79 Alexander St. Yonkers, N.Y.
Cable: ENEQCO Phone Yonkers 8-8118-9

**WACKER BREWERY, LANCASTER, PA. CLOSES**

Offers for sale late model equipment, erected as last used up until the time the brewery closed a few weeks ago, and including Frick 6x6, Type G ammonia compressor, Serial # 52733, with automatic controls and V-belt driven to a General Electric 30 hp., splash-lubricated, 50/60 cycle, 3-phase, 1455/1750 r.p.m., motor; with controls; and also York 7 x 7 Shop # 46833 ammonia compressor, with Westinghouse 40 hp., 60 cycle, 220 volt, 3 phase, 870 r.p.m., style 169160, Serial #1820128 motor and controls; 12" dia. x 16' long ammonia receiver; ammonia condensers, thousands of feet of ammonia pipe; individual room blowers or diffusers, steel tanks, etc. Inspection invited, or communicate with Mr. James, c/o WACKER BREWERY, 203 W. Walnut St., Lancaster, Pa. Telephone 7367.

**FOR SALE**
**NEW EQUIPMENT — NEVER USED**

310 ton York water chilling set-up complete with 300 hp. motor, Turbo compressor, speed increaser, chiller, condenser, controls, etc.

9x9 York with 75 hp. synchronous motor.
7½x7½ Yorks with V-belt 50 hp.
Two 6x6 Yorks with V-belt drives 30 hp.

**JOHN F. CARSON**
A & Venango Sts. Philadelphia 34, Pa.
GArfield 6-2221

FOR SALE—One Gifford-Wood F2 scoring machine, for 400 lb. blocks, 5 h.p., 220-440 volt; Serial 162957. This unit was purchased new in 1948 and removed from service June 1953. It has been idle at our plant, but was used right up until 1953. Contact Mr. Walter K. Scherer, Ottawa Ice and Fuel Co., Ottawa, Ill. Phone 752.

**FOR SALE**

2—20 h.p. G.E. Freon compressors and motors — belt drive, complete with controls & starters.
1—15 h.p. G.E. Freon compressor & motor—belt drive, complete with controls & starter.
1—extra 20 h.p. G.E. motor.
1—Niagara med. tem. blower complete with controls Model 133.
2—Niagara low tem. blowers, automatic defrosting, complete with controls, Model 123.
2—McQuay med. tem. blowers.

All the above equipment is installed and in good operating order. We will consider offers for all or part of the above equipment.

**DAISY VALLEY FOODS CO.**
6031 Joy Road Detroit 4, Mich.
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**Coils, Headers, Fabrications**

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**Industrial Power Plants**
**Refrigeration and**
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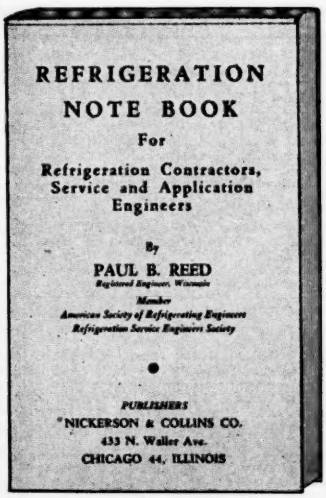
**Reports, Appraisals and Management**

# A Vest Pocket Book of Valuable Data REFRIGERATION NOTE BOOK

*by* PAUL B. REED




**Vest Pocket Size—3¼ x 5 inches**
**204 Pages—Flexible Binding**

THIS NOTE BOOK of condensed refrigeration information represents many years of work in accumulating practical data—"culling out" all extraneous material—so as the author states, "the reader will find a handy and easily carried source of information not usually kept in memory."

You will be surprised at the wealth of material that has been included in this convenient and practical reference Note Book. It is written in layman's language, without complicated formulas. In short, it is a tool responsible for the operation of refrigeration equipment.

**$2.00 Postpaid**

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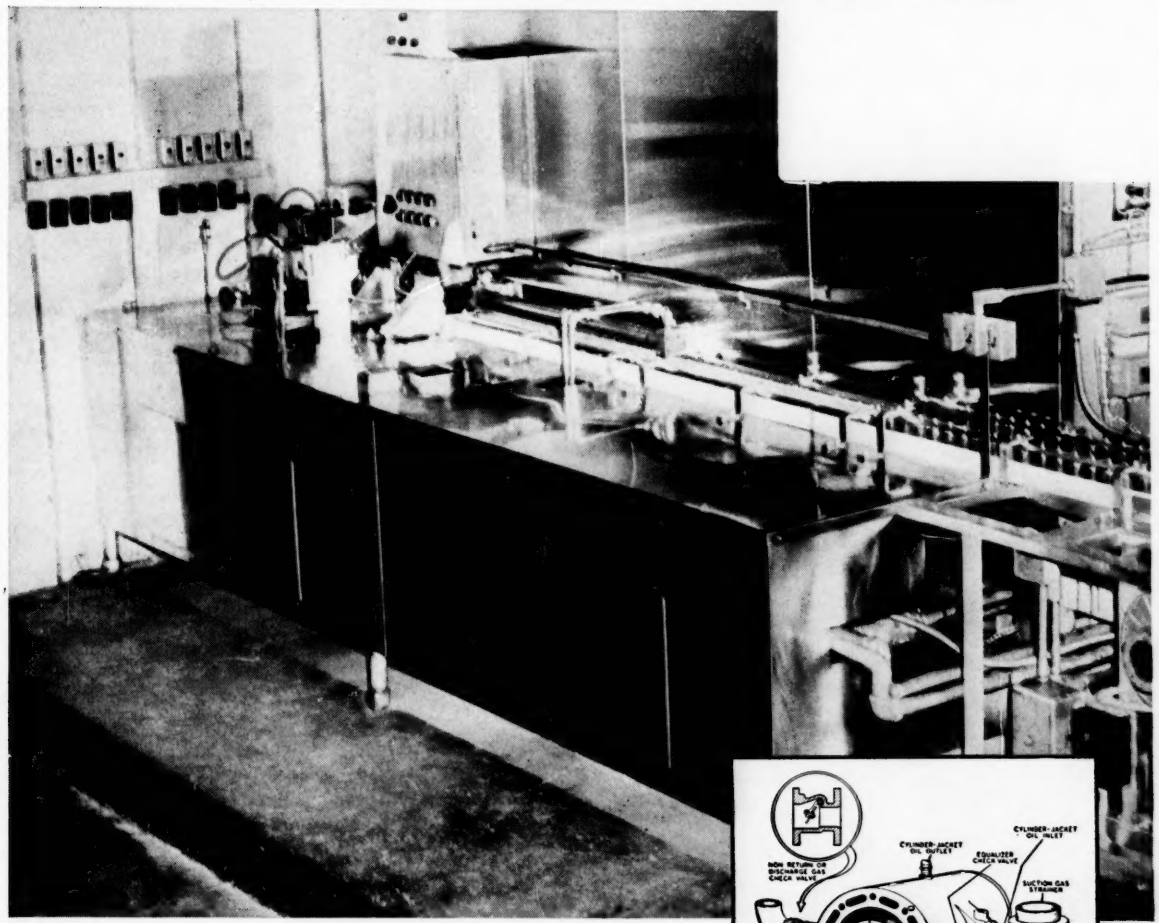
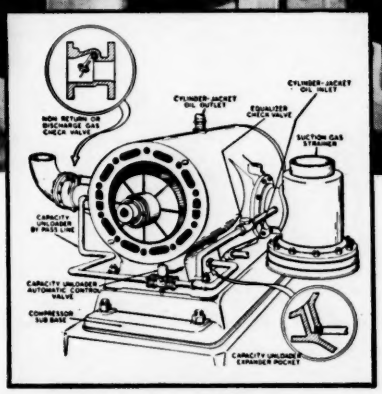
# Continuous Freezing of Retail Cartons at Rate of 180 per Minute Requires Only One Operator

## *at Stokely-Van Camp, Inc., Winnebago, Minn.*



Frozen food packages entering the Freezing Equipment Sales continuous freezer from high-speed filler. Compact insulated room freezes 24,690 12-oz. packages at one time. Only the product enters and leaves the room.




Stokely-Van Camp selected F.E.S.-Fuller Rotaries to provide a flexible two stage refrigeration system capable of matching a variable refrigeration load. Stokely-Van Camp's battery of Plate Frosters, loose product Belt Freezer and continuous Package Freezer are served by F.E.S.-Fuller Rotaries under varying refrigeration requirements from 3" to 10" Hg. Vacuum.

Compactness and simplicity of design make **FES-Fuller** Rotary the most popular refrigeration booster. Rotary principle of gas compression insures high efficiency at large gas volumes to give compact and light weight machine generally smaller than the driving motor. Absence of suction and discharge valves, connecting rods and crankshaft give a simplicity in design which guarantees low maintenance cost and quick overhaul if any plant shutdown is necessary.

Whatever *your* refrigeration requirements, turn to service-proved **FES-Fuller Rotary Booster.**

***Write for more information.***

**FES FULLER**

1973
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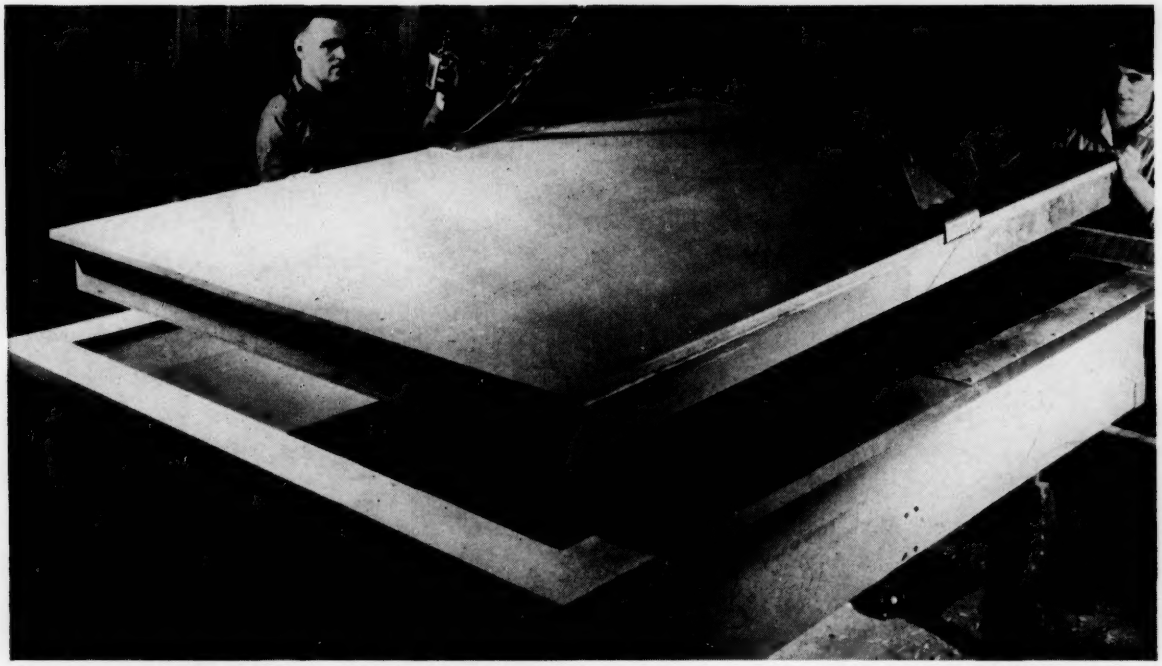
**FREEZING EQUIPMENT SALES, INC., 1405 N. DUKE Street, YORK, PENNA.**

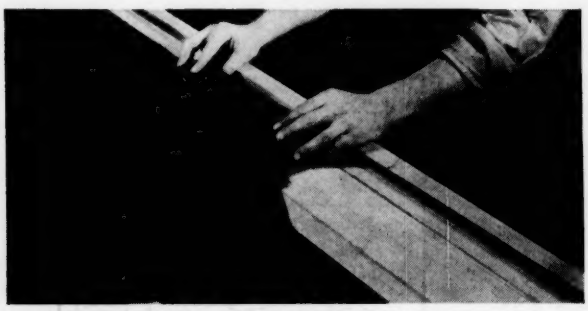
Qualified distributors in principal cities

*LOW TEMPERATURE FREEZING EQUIPMENT*

# Inside and out...Jamison cold storage doors show *quality* construction



**Box girder construction of highest quality boat hull plywood** gives maximum strength and rigidity. Large series "50" door is shown as door and frame meet on assembly line.



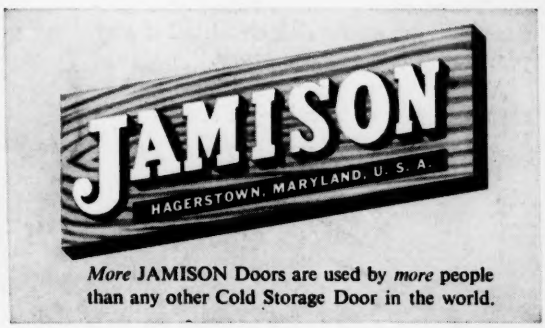
**Insulation**—Each block of insulation is individually measured and cut to give maximum insulation efficiency.

## Materials and workmanship assure top efficiency in rugged service

The reason behind the reputation of the Jamison Series "50" Cold Storage Door is apparent here. Some of the most important parts and components are never seen by customers . . . Yet operational efficiency in all types of installations continues to prove that Jamison quality materials and precision workmanship mean superior protection and overall economy.

If you have plans for modernization or expanding, first get the story on Jamison's Series "50" Door. Write for your copy of Catalog F-61. Jamison Cold Storage Door Co., Hagerstown, Md.

**Tight Seal** is assured by carefully applied gasketing. Gasket is soft sponge rubber resistant to acids, oils and greases.




*More* JAMISON Doors are used by *more* people than any other Cold Storage Door in the world.